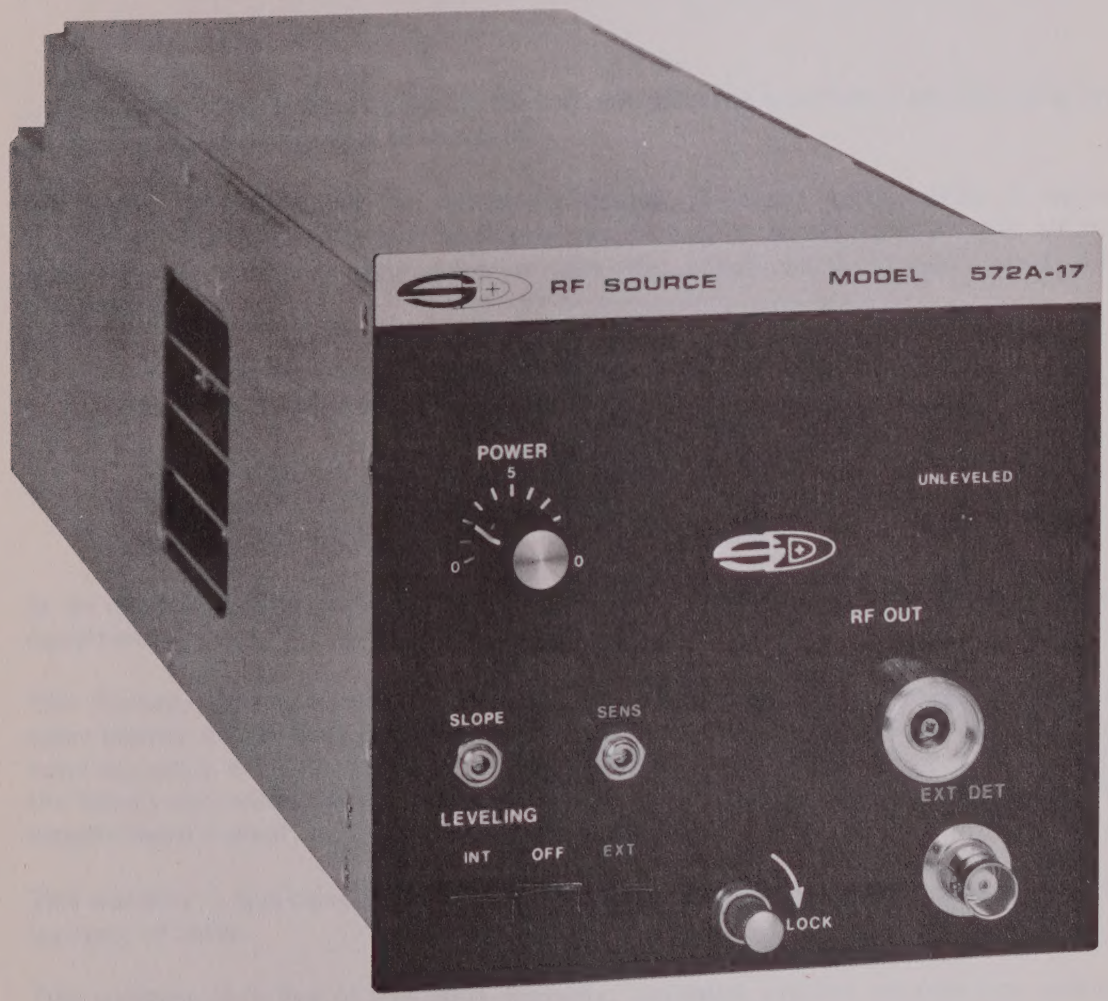
RF PLUG-IN UNIT

MODEL 572A-17

2.0 TO 18.5 GHz

SYSTRON DONNER

OPERATION AND SERVICE MANUAL



© Copyright 1977
SYSTRON DONNER CORPORATION
ONE SYSTRON DRIVE
CONCORD, CALIFORNIA 94518 USA

RF PLUG–IN UNIT

MODEL 572A–17

2.0 TO 18.5 GHz

MICROWAVE DIVISION
SYSTRON DONNER CORPORATION

PRINTED June 1, 1977
MANUAL P/N 950780

SYSTRON DONNER
CORPORATION

EQUIPMENT WARRANTY

Seller warrants equipment of its manufacture against defective materials or workmanship for a period of one year from date of shipment.

The liability of Seller under this warranty is limited, at Seller's option, solely to repair, replacement with equivalent Systron-Donner equipment, or an appropriate credit adjustment not to exceed the original equipment sales price, of equipment returned to the Seller, provided that:

> The defective equipment is returned to Seller's designated repair location, transportation charges prepaid by Buyer, and
>
> Seller's examination of such equipment discloses to its satisfaction that defects were not caused by negligence, misuse, improper installation, accident, or unauthorized repair or alteration by Buyer.

In no event shall Seller be liable for collateral or consequential damages due to defective equipment.

This warranty does not include mechanical parts failing from normal usage, nor does it cover limited-life electrical components which deteriorate with age, such as vacuum tubes, batteries, lamps, or accessories not manufactured by the Seller, but which are furnished with the Seller's equipment. Seller's liability is limited to whatever warranty is extended by the manufacturers thereof and transferable to the Buyer.

This warranty is applicable to the original Buyer only and constitutes the sole and exclusive warranty of Seller.

This warranty is in lieu of any other warranty, expressed, implied, or statutory, and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

Systron-Donner Corporation
Microwave Division
14844 Oxnard Street
Van Nuys, CA 91411

MANUAL ERRATA

PAGE	PARA/FIG.	CHANGE
4-11/4-12	Figure 4-4	1) Lower right corner, near pin AE: move Zener diode symbol from –20V side of unnumbered resistor to –11 V CLAMP SUPPLY side of resistor. 2) Relays K1 and K3 are incorrectly marked; change K1 to read *K3* and K3 to read *K1*.
4-21/4-22	Figure 4-7	Right center, below A6: change designation of DRIVER Q4 to read *DRIVER Q1*.
6-8	6-3.5.2	Change paragraph number to read *6-3.5.3.*
6-10	6-2.5.3	Change paragraph number to read *6-3.5.4.*
8-5/8-6	Figure 8-2	Add cathode marking stripe to left side of CR13.
8-7/8-8	Figure 8-3	1) Upper right corner: change P1-9 callout to read *TO PIN SWITCH CONTROL (E4) BAND 3.* 2) Upper right corner: change P1-4 callout to read *TO PIN SWITCH CONTROL (E3) BAND 1.* 3) Lower right corner: change Note 2 to reference *Figure 5-1.*

TABLE OF CONTENTS

Section		Title	Page
I		GENERAL INFORMATION	1-1
	1-1.	Scope	1-1
	1-2.	Description of Equipment	1-1
	1-3.	Capabilities and Performance	1-2
II		INSTALLATION	2-1
	2-1.	Unpacking and Inspection	2-1
	2-2.	Preparation for Use	2-1
	2-3.	Repackaging for Shipment	2-2
	2-4.	Shipping Method	2-2
	2-5.	Insurance	2-2
	2-6.	Returns for Repair	2-2
III		OPERATING INSTRUCTIONS	3-1
	3-1.	Scope	3-1
	3-2.	Front Panel Controls, Indicators, and Connectors	3-1
	3-3.	Rear Panel Controls and Connectors	3-1
	3-4.	Initial Operating Procedures	3-1
	3-5.	Hints and Precautions	3-1
IV		CIRCUIT DESCRIPTION	4-1
	4-1.	Overall Functional Description	4-1
	4-2.	Detailed Functional Descriptions	4-3
V		PERFORMANCE CHECKS AND CALIBRATION	5-1
	5-1.	General	5-1
	5-2.	Performance Checks	5-1
	5-3.	Calibration	5-21
VI		MAINTENANCE	6-1
	6-1.	General	6-1
	6-2.	Routine Maintenance	6-1
	6-3.	Corrective Maintenance	6-2
VII		REPLACEABLE PARTS LISTS	7-1
	7-1.	Introduction	7-1
	7-2.	Replacement Parts	7-1
	7-3.	Explanation of Columns	7-1
	7-4.	Manufacturers' Codes	7-2
VIII		SCHEMATICS AND BOARD DRAWINGS	8-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	Model 572A-17 Multiband RF Plug-in	1-1
3-1	Front Panel Controls, Indicators, and Connectors	3-2
3-2	Rear Panel Controls and Indicators	3-5
3-3	Initial Operating Procedure	3-8
4-1	Model 572A-17 Functional Block Diagram	4-2
4-2	Gate Logic Truth Tables	4-5
4-3	Band Select Functions Simplified Schematic Diagram	4-7
4-4	Tuning Amplifiers Simplified Schematic Diagram	4-11
4-5	Multiband Sweep Timing Diagram	4-14
4-6	Oscillator Drivers Simplified Schematic Diagram	4-17
4-7	Amplitude Modulation Functions Simplified Schematic Diagram	4-21
4-8	+15 Volt Regulator Simplified Schematic Diagram	4-24
4-9	−15 Volt Regulator Simplified Schematic Diagram	4-25
5-1	Location of Components, Adjustments, and Reference Test Points	5-23
5-2	Test Setup for Oscillator Driver Calibration	5-27
5-3	Test Setup for Continuous Band Adjustments	5-31
6-1	Semiconductor Basing Diagram	6-4
6-2	APC–7 Connector	6-5
6-3	Disassembly Procedures	6-14
6-4	Troubleshooting Diagram	6-21
8-1	RF Deck Interconnect Diagram	8-3
8-2	A1 Continuous Sweep Mother Board Parts Location	8-5
8-3	A1 Continuous Sweep Mother Board Schematic Diagram	8-7
8-4	A2 Band 1 Oscillator Driver Board Parts Location/Schematic Diagram	8-9
8-5	A3 Band 2 Oscillator Driver Board Parts Location/Schematic Diagram	8-11
8-6	A4 Band 4 Oscillator Driver Board Parts Location/Schematic Diagram	8-13
8-7	A5 Power Meter Leveling Board (Option M7) Parts Location/Schematic Diagram	8-15
8-8	A6 Interconnect Board Parts Location/Schematic Diagram	8-17

LIST OF TABLES

Table No.	Title	Page
1-1	Performance Specifications	1-4
3-1	Front Panel Controls, Indicators, and Connectors	3-3
3-2	Rear Panel Controls and Connectors	3-6
5-1	Performance Checks	5-2
5-2	Test Equipment Required for Performance Checks	5-2
5-3	Calibration Procedures	5-20
5-4	Test Equipment Required for Calibration	5-21

SECTION I

GENERAL INFORMATION

1-1. SCOPE

This manual provides general information, installation data, operation instructions, circuit descriptions, maintenance data, performance checks, calibration procedures, parts lists, and circuit diagrams for the Systron-Donner (Microwave Division) Model 572A-17 Multiband RF Plug-in.

The Model 572A-17 Multiband RF Plug-in Unit, hereinafter referred to as the Model 572A-17, the plug-in, or the unit, is shown in Figure 1-1 being installed in a Model 540B Multiband Sweeper Mainframe. Instructions for operation and service of the mainframe are contained within manual part number 950775 for Model 540B or the earlier (unnumbered) manual for Model 540 or Model 540 with 540A supplement.

Figure 1-1. Model 572A-17 Multiband RF Plug-in

1-2. DESCRIPTION OF EQUIPMENT

The Model 572A-17 operates over the frequency range of 2 to 18.5 GHz; installed in a 540B or 540 mainframe, the output of the plug-in may be swept in either direction over all or a part of this range, amplitude or frequency-modulated, or utilized as a frequency-agile RF source in systems operation.

The plug-in is supplied with a dial drum comprising four separate frequency scales to calibrate the output frequency over the 2 to 8 GHz band, the 8 to 12.4 GHz band, the 12.4 to 18.5 GHz band, or the continuously-swept 2 to 18.5 GHz band.

Major subassemblies of the Model 572A-17 are the RF deck, continuous-sweep mother board, three plug-in oscillator driver boards, an optional internal leveling detector, and an optional power meter leveling board. The RF deck is removable as an entity and is attached to the 572A-17 control circuitry with a plug-on flexible cable to allow servicing of the RF components while the body of the plug-in is installed in the 540-series mainframe.

1-3. CAPABILITIES AND PERFORMANCE

The Model 572A-17 plug-in, used within a 540-series mainframe, is intended for use in laboratory and field tests of electronic communications components, subsystems, and systems by offering a precisely-calibrated alternative to time-consuming point-by-point testing of amplitude versus frequency characteristics over wide ranges.

Detailed performance specifications for the plug-in are given in Table 1-1.

Salient features of the unit are summarized in the following paragraphs.

1-3.1 External Power Requirements

All required power is supplied by the 540-series mainframe; the plug-in contains a + and - 15 volt power supply regulator which provides plug-in current requirements beyond the capability of the + and - 15 volt supplies in the mainframe.

1-3.2 Frequency Range

The Model 572A-17 uses three fundamental-frequency microwave oscillators to cover 2 to 8, 8 to 12.4, and 12.4 to 18.5 GHz. The outputs are multiplexed to cover the complete usable range of 2 to 18.5 GHz in a single frequency sweep. Band selection is accomplished by a rotary switch on the sweeper mainframe which simultaneously rotates the applicable portion of the supplied frequency scale drum into view. Operating and marker frequencies are indicated by colored pointers over the frequency scale. Dial accuracy is ±1 percent in any of the single bands or ±2 percent in the continuous sweep band.

1-3.3 Mainframes

The plug-in may be used in Model 540, Model 540A, or Model 540B sweeper mainframes. Operation of the plug-in is similar in all mainframes except that earlier mainframes may not be equipped with marker controls; only 540B marker controls are direct-reading.

1-3.4 Leveling and Amplitude Control

Several methods of leveling (controlling the output amplitude of the plug-in to generate an essentially unvarying power level over the swept frequency range) and amplitude modulation are available. The output may be unleveled, leveled by the feedback from an external negative output crystal detector, leveled by the feedback from an internal directional detector (Option M2), or leveled by the output of a microwave power meter (Option M7). The output may be modulated by a 1 kHz square wave generated within the mainframe, or modulated by an externally-supplied input through the mainframe.

1-3.5 Frequency Modulation

In addition to the frequency control signals from and through the mainframe, narrow or wide-band FM signals may be coupled directly into the 572A-17 for frequency or phase-locking to an external standard or generation of FM outputs.

1-3.6 Sweep Control Interface

The plug-in actively interfaces with sweep generation circuits within the 540-series mainframe to prevent selection of an excessively fast sweep rate in continuous (band 4) sweep mode. No operator action is required; the action is completely automatic and prevents distortion in the detected output signal at the fastest sweep speeds. This interface circuitry is not present in early production Model 540's (but refer to Paragraph 6-3.7, Section VI).

1-3.7 Optional Configurations

1-3.7.1 OPTION M2 INTERNAL POWER LEVELING. Model 572A-17 RF plug-in units with Option M2 have an internally-mounted precision directional coupler and crystal detector to allow power leveling at connector J6, RF OUT.

1-3.7.2 OPTION M7 POWER METER LEVELING. Units with this option have added circuitry to allow the output power to be leveled by the feedback from an external microwave power meter. The input range is zero to 1 volt, either polarity; a front-panel switch actuated by the POWER knob is used to select the power meter leveling mode. When the switch is deactivated, presence of the power meter leveling circuitry does not interfere with normal crystal detector leveling.

1-3.7.3 OPTION M12. Units with this option have a precision stainless steel Type N female RF OUT connector rather than the normally-supplied (Amphenol) APC-7, 7-millimeter male connector.

1-3.7.4 OPTION M26 REAR PANEL CONNECTOR. For units used in systems application, a rear panel RF output is sometimes desirable; Option M26 units have a rear-panel rather than a front-panel RF OUT connector.

1-3.8 Accessories

1-3.8.1 DIAL SCALE DRUM. One four-band dial scale drum is supplied with each 572A-17 RF plug-in; the dial scale drum is installed in the 540-series mainframe as the RF plug-in is installed to give direct readout in frequency of operating and marker frequencies (marker frequency readout is direct in Model 540B only).

1-3.8.2 MODEL 593 FLEXIBLE PLUG-IN EXTENSION. The 572A-17 may be operated outside the mainframe using this three-foot extension cable; access to the plug-in for maintenance is otherwise somewhat limited. (Not for use during calibration.)

1-3.8.3 EXTERNAL LEVELERS. A directional power detector is required for leveling the RF output amplitude of the plug-in when the unit is not equipped with Option M2 internal power leveling or for leveling at the end of a long cable run. Model 1021 covers the 2 to 18 GHz range with a leveling flatness of ±1 dB; a variety of levelers with greater precision covering the single-band ranges is also available from Systron-Donner.

Table 1-1. Performance Specifications

ITEM	PARAMETER	SPECIFICATION
1	Frequency Range	
1.1	Band 1	2.0 to 8.0 GHz
1.2	Band 2	8.0 to 12.4 GHz; usable 7.9 to 12.5 GHz
1.3	Band 3	12.4 to 18.0 GHz; usable 12.3 to 18.5 GHz
1.4	Band 4	2.0 to 18.0 GHz; usable 2.0 to 18.5 GHz
2	Frequency Accuracy	@25°C ambient and full power output
2.1	Bands 1 - 3	≤±1% of indicated frequency
2.2	Band 4	≤±2% of indicated frequency
		(Combination of mainframe and plug-in specifications; worst case)
3	Frequency Stability	
3.1	Δ Temperature	≤±.05%/°C
3.2	Load VSWR to 3:1	≤±0.3%
3.3	Δ Power out to 6 dB	≤±0.25%
3.4	Δ Line Voltage of ±10%	≤±.001% (Combination of mainframe and plug-in specifications; worst case)
4	Power Output	Into 50 Ω @ 25°C
4.1	Unleveled	
4.1.1	2.0 to 8.0 GHz	≥+8 dBm (6.3 mW)
4.1.2	8.0 to 18.0 GHz	≥+10 dBm (10 mW)
4.2	Internally Leveled (Option M2)	≥+7 dBm (5 mW)
5	Power Variation (Flatness)	
5.1	Unleveled	
5.1.1	2.0 to 8.0 GHz	≤±3 dB
5.1.2	8.0 to 12.4 GHz	≤±3 dB
5.1.3	12.4 to 18.0 GHz	≤±3 dB
5.1.4	2.0 to 18.0 GHz	≤±6 dB
5.2	Internally Leveled (Option M2)	≤±1 dB
5.3	Externally Leveled	≤±.05 dB (excluding variations in external leveling apparatus)

Table 1-1. Performance Specifications (Continued)

ITEM	PARAMETER	SPECIFICATION
6	Spurious Signals	Level below full rated output
6.1	Harmonically Related	
6.1.1	2.0 to 3.0 GHz	≥18 dB
6.1.2	3.0 to 5.0 GHz	≥20 dB
6.1.3	5.0 to 18.0 GHz	≥25 dB
6.2	Non-Harmonic	≥60 dB (all spurious ≥1.0 MHz from output frequency)
7	Residual FM	CW mode, 1 Hz to 30 kHz bandwidth
7.1	2.0 to 8.0 GHz	≤35 kHz peak
7.2	8.0 to 12.4 GHz	≤35 kHz peak
7.3	12.4 to 18.0 GHz	≤35 kHz peak
7.4	2.0 to 18.0 GHz	≤40 kHz peak
8	Residual AM	@ Full power output, 100 kHz bandwidth
8.1	Unleveled	≥-46 dBm
8.2	Leveled	≥-40 dBm
9	Power Control Range	
9.1	Unleveled	≥30 dB
9.2	Leveled	≥6 dB
10	Slope Control Range	≥+3 dB
11	FM Input Sensitivity	
11.1	Wide	-10 MHz/+V; 10 kΩ
11.2	Narrow	
11.2.1	2.0 to 8.0 GHz	300 kHz/mA; 2 Ω
11.2.2	8.0 to 18.0 GHz	150 kHz/mA; 2 Ω
12	External Leveling Sensitivity	-10 mV/mW; 22 Ω to 10 kΩ
13	Band Changeover Delay (Band 4)	Typically ≤3 ms

Table 1-1. Performance Specifications (Continued)

ITEM	PARAMETER	SPECIFICATION
14	Dimensions	
14.1	Height	4.9 inches (12.45 centimeters)
14.2	Width	5.1 inches (12.95 centimeters)
14.3	Depth	16.15 inches (41 centimeters) including knobs
15	Weight	≈10 pounds (4.54 kilograms) including all options
16	Environment	
16.1	Operating	0 to +55°C (+32 to +131°F) ambient
16.2	Non-operating	-55 to +85°C (-67 to +185°F)
16.3	Altitude	0 to 10,000 feet (3.05 km)
17	Service Conditions	Equipment meets performance specifications for Systron-Donner Class B environmental standards.

SECTION II

INSTALLATION

2-1. UNPACKING AND INSPECTION

2-1.1 The instrument is shipped in a specially constructed container to provide maximum protection during transit. Use care when unpacking to prevent damage to the equipment such as cabinet finish, controls, connectors, etc.

2-1.2 Removing Contents

To remove the instrument from the shipping container, cut and fold back outer carton top flaps, remove top protective cushion, lift instrument clear of shipping container, open dust protection bag, and remove.

2-1.3 Inspection

The instrument was carefully tested and inspected prior to shipment. Inspect the instrument for damage incurred during shipment. If the instrument is damaged in any way, notify the freight carrier immediately. Do not discard any packing materials, as the freight carrier's agent will wish to examine them.

2-2. PREPARATION FOR USE

Each RF plug-in is supplied with a metal dial drum for frequency readout in the sweeper mainframe.

1. Insert the RF plug-in into the rectangular hole at the right-hand side of the 540 or 540B.

2. Rotate the small knob at the bottom of the front panel at least five turns ccw, then lock the plug-in in place by turning the knob cw until it is tight.

3. If necessary, install the dial drum in the 540-series mainframe, following steps 4 through 8.

4. Remove the top cover of the instrument; it is held in place with two screws.

5. Face the instrument, holding the dial scale drum with its gear to the left and smooth, rounded end knob to the right.

6. Push the smooth knob into its mating receptacle near the plug-in compartment shield. The spring will give way, allowing you to lower the left side of the drum.

7. Snap the drum into place and align the locating key with the mating groove in the left side of the drum assembly.

8. Rotate the BAND SELECT knob to ensure smooth operation of the drum assembly.

9. Replace the top cover; if one of the screws is shorter than the other, it must be used on the plug-in compartment side.

2-3. REPACKAGING FOR SHIPMENT

If the instrument is to be packaged for re-shipment, use the original shipping container and packaging. If the original packaging has been discarded or is not in condition for re-use, perform the following packaging procedure:

1. Wrap the instrument in a heavy paper wrapping or plastic protective covering.

2. Place a protective cushion in the bottom of the shipping carton and place the instrument on the cushion.

3. Surround the remaining sides and top with additional protective cushions. Place front and rear cushions to provide support for the instrument without resting it on the controls or connectors.

2-4. SHIPPING METHOD

This instrument should be shipped only by truck freight, rail freight, air freight, or parcel delivery service. If it is shipped by parcel post, damage is likely to occur. Systron-Donner is not responsible for units damaged in shipment, whether such units are in-warranty or not.

2-5. INSURANCE

For your own protection, insure the unit for full value whenever it is shipped.

2-6. RETURNS FOR REPAIR

Be sure to fully identify any instrument that is returned to Systron-Donner or a Systron-Donner Service Center for repair of any kind, in-warranty or not. The paperwork with the unit must show the instrument serial number, a description of the problem or malfunction to be corrected, and the exact address to which the instrument should be returned when repair is completed. Please also include the name and telephone number of the cognizant party in your organization; this may speed the identification and repair of malfunctions.

SECTION III

OPERATING INSTRUCTIONS

3-1. SCOPE

This section contains descriptions of all operating controls and indicators, an initial operating procedure, and a summary of precautions for proper usage of the 572A-17 RF plug-in. Specific operating instructions for the 540-series sweeper mainframe are contained in the manual supplied with the sweeper.

3-2. FRONT PANEL CONTROLS, INDICATORS, AND CONNECTORS

The front panel controls, indicators, and connectors are illustrated in Figure 3-1, and are listed and described in Table 3-1.

3-3. REAR PANEL CONTROLS AND CONNECTORS

The rear panel controls and connectors are illustrated in Figure 3-2, and are listed and described in Table 3-2.

3-4. INITIAL OPERATING PROCEDURES

Figure 3-3 contains condensed initial operating procedures for the 572A-17 and 540B mainframe. These procedures are applicable to any swept signal measurement situation over the operating range of the plug-in.

3-5. HINTS AND PRECAUTIONS

3-5.1 Changing Plug-ins

It is imperative that the mainframe power be turned off before removing or inserting the RF plug-in. Although damage will not normally result if this caution is ignored, the mainframe line fuse may be caused to blow unnecessarily. Most important, accidental misalignment of connector pins while the power is on can cause serious damage to the plug-in.

WARNING

DISCONNECT THE POWER CORD COMPLETELY BEFORE ATTACHING THE MODEL 593 FLEXIBLE EXTENSION CABLE TO THE PLUG-IN CONNECTOR. PINS 20 AND 21 CARRY 110 VAC. PIN 18 CARRIES 250 VDC.

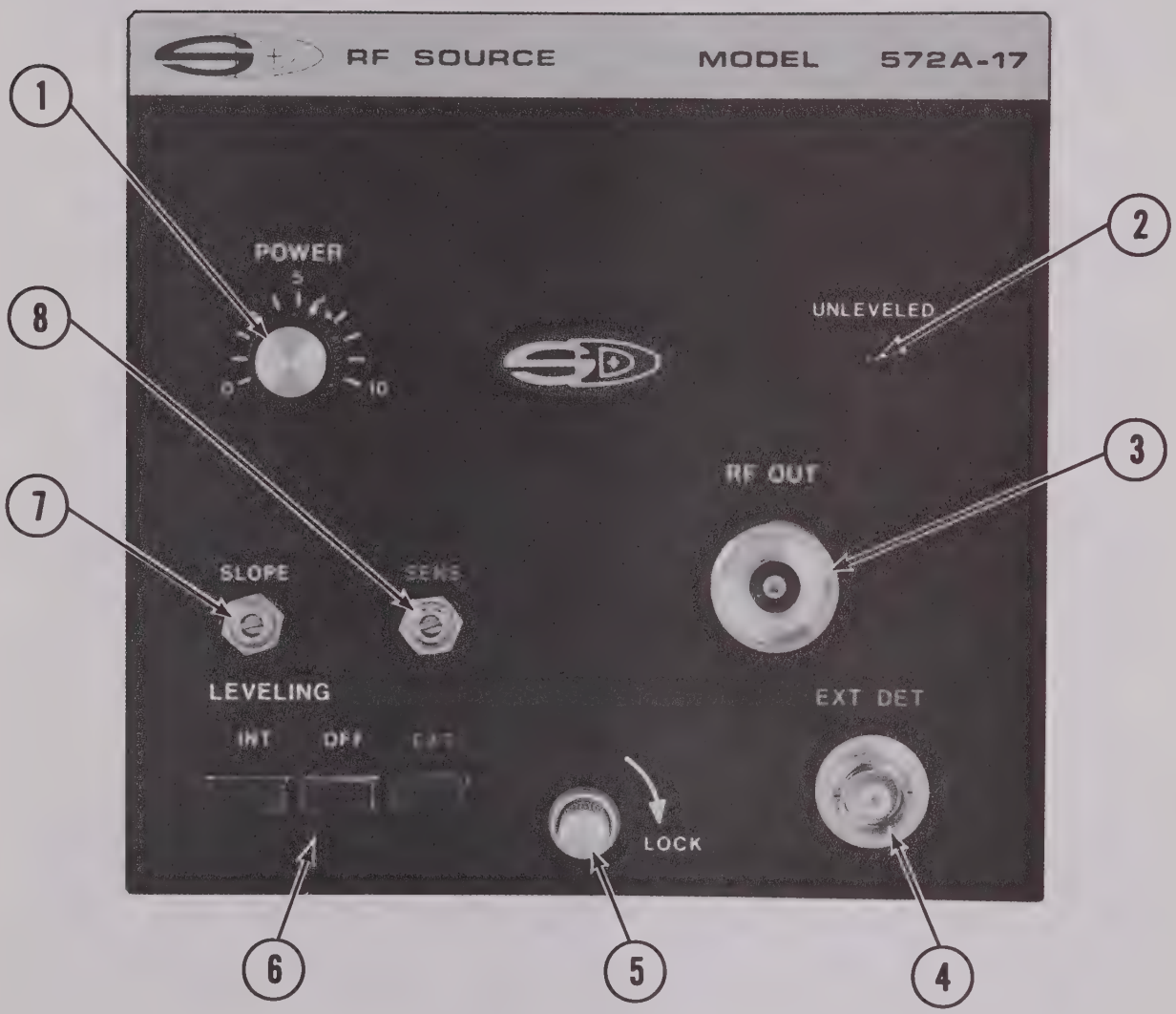


Figure 3-1. Front-Panel Controls, Indicators, and Connectors

Table 3-1. Front-Panel Controls, Indicators, and Connectors

INDEX NO. (FIG. 3-1)	FRONT PANEL NAME AND DESCRIPTION	FUNCTION
1	POWER control	Controls the RF output amplitude of all bands of the plug-in. This control typically has a range of over 30 dB in unleveled, and 6 dB in leveled mode. In units equipped with power meter leveling, Option M7, a pull-on, push-off switch coupled to the shaft of the POWER control activates the power meter leveling circuitry.
2	UNLEVELED indicator	Red light-emitting diode illuminates to indicate that LEVELING OFF pushbutton has been depressed, or that the setting of the POWER control is too high when the LEVELING INT or LEVELING EXT pushbutton is depressed; the indicator will illuminate when the external leveler is disconnected or functioning abnormally in external leveling mode.
3	RF OUT connector	The RF output is fed to this male APC-7 connector; output impedance is 50 Ω.
4	EXT DET connector	The external detector or power meter leveling signal for all bands is fed through this isolated BNC connector.
5	Locking Screw	Used to lock plug-in in place in mainframe. NOTE: This knob must be tightened to ensure low noise and proper seating of the interface connector.
6	LEVELING pushbutton switches	These switches select the operating mode of the output-leveling circuits and are interlocked so that only one may be engaged at a time. In units equipped with Option M2, the RF output is leveled at the RF OUT connector of the plug-in without using an external detector.

Table 3-1. Front-Panel Controls, Indicators, and Connectors (Continued)

INDEX NO. (FIG. 3-1)	FRONT PANEL NAME AND DESCRIPTION	FUNCTION
6	LEVELING pushbutton switches (continued)	
	OFF	The RF output is unleveled, but the RF LEVEL control may be used for control. Maximum peak power output is available in this position.
	EXT	The plug-in may be externally leveled. In the EXT position, an external negative voltage at the EXT DET connector is used to control the RF output over the frequency range of the unit. There is no control of power level when the leveler input is disconnected; the output is either fully on or fully off. In units equipped with Option M7, a zero to + or -1 volt power meter "recorder" output signal may be used instead of the output of a crystal detector.
7	SLOPE control	Controls the amount of slope compensation in the RF output at the high-frequency end of the swept band to overcome the rolloff characteristics of cables and other coaxial devices. Control range is ≥ 3 dB.
8	SENS adjustment	Screwdriver-adjust potentiometer acts as a video load for the external detector for fastest response and as an input attenuator to adjust for proper leveling with external leveler. Does not affect internal leveler. Range: 22 Ω to 10 kΩ.
Not Shown	M7/M7A switch	In units equipped with power meter leveling, Option M7, this slide switch mounted on A5 inside the plug-in is used to select a negative (M7) or positive (M7A) input from the power meter. (Refer to Figure 5-1, Section V, for the location of A5.)

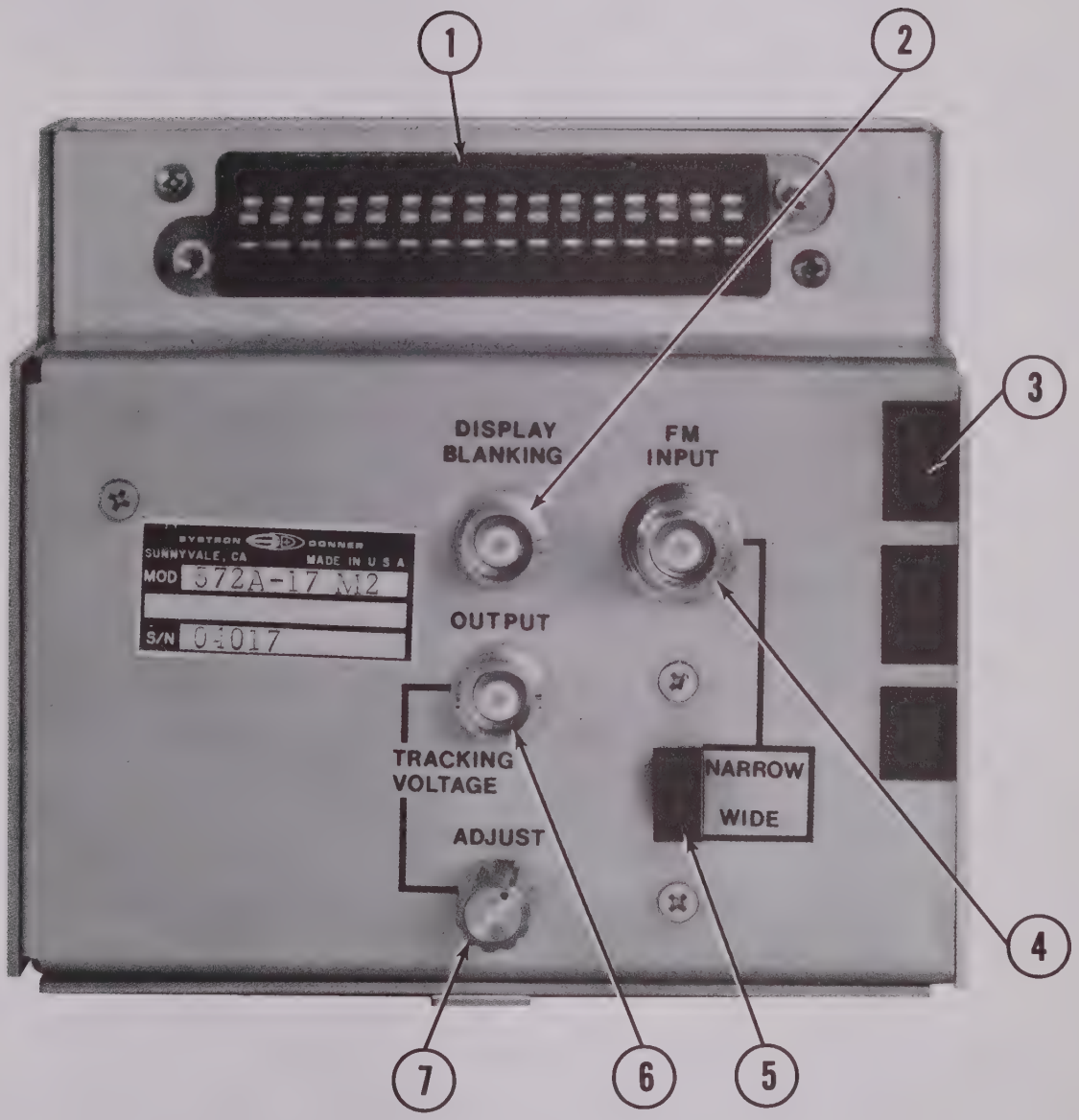


Figure 3-2. Rear Panel Controls and Connectors

Table 3-2. Rear-Panel Controls and Connectors

INDEX NO. (FIG. 3-2)	REAR PANEL NAME AND DESCRIPTION	FUNCTION
1	Interface Connector	32-pin connector. Mates to connector in mainframe plug-in compartment, allowing operating and signal voltages to be passed between the units.
	WARNING PINS 18, 20 AND 21 CARRY LETHAL VOLTAGE.	
2	DISPLAY BLANKING connector	This connector supplies a -10 V pulse during sweep retrace or band crossover to blank the intensity circuits of the Systron-Donner Model 7000 or other display unit. This connector, rather than the mainframe rear-panel BLANKING connector, should be used to blank the display if you wish to eliminate the intensity dots at the band crossover points in continuous sweep mode.
3	Air Intake Filter	Refer to Section VI for replacement/cleaning instructions.
4	FM INPUT connector	Isolated BNC connector. The current-mode signal for narrow FM'ing or the voltage-mode signal for wide FM'ing may be fed in at this point.
5	FM INPUT NARROW/WIDE switch	Slide switch. Selects mode of phase locking or FM'ing the selected oscillator:
	NARROW	The FM input from J4 is connected directly to the fast FM coil in all oscillator modules; frequency response is narrow.
	WIDE	The input from J4 is connected to the oscillator driver boards; sensitivity is typically 10 MHz/volt.

Table 3-2. Rear-Panel Controls and Connectors (Continued)

INDEX NO. (FIG. 3-2)	REAR PANEL NAME AND DESCRIPTION	FUNCTION
6	TRACKING VOLTAGE OUTPUT connector	BNC connector carries a voltage proportional to RF output frequency for use with polar displays or network analyzers. The output level is zero to +5 volts per band in a single-band mode or zero to a maximum of +5 volts per octave in continuous sweep mode.
7	TRACKING VOLTAGE ADJUST control	Adjusts maximum level of tracking voltage output from zero to > 20 volts (operates in continuous sweep mode only) -- adjusted to match characteristics of polar display or network analyzer which may be used with the 572A-17. The voltage is proportional to frequency over the operating range. For example, if this control is set for an output of 16.5 at the end of sweep, the tracking voltage will be calibrated for a level of Δ1 volt per Δ 1 GHz from 2 to 18.5 GHz.

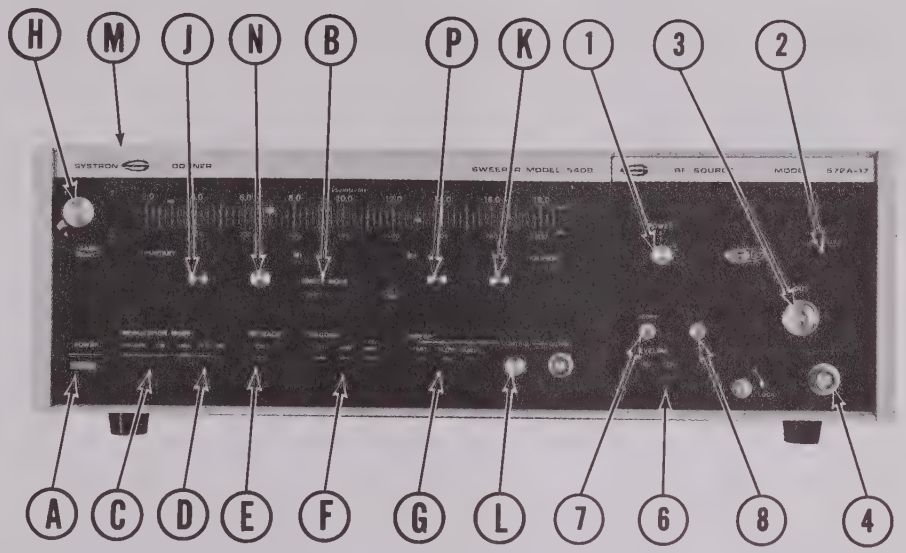
3-5.2 Internal Modulator

The 540-series mainframe internal 1 kHz modulator drives the modulator of the 572A-17 with a square wave, reducing the RF output of the plug-in on positive 1 kHz peaks. Most VSWR amplifiers and ratiometers will respond to the demodulated 1 kHz signal. If one of these units is being used, the 1 KHZ ADJ control on the rear panel of the 540 or 540B should be tuned for maximum response of the meter in use before measurements are made. Tuning the plug-in modulating frequency to that of the VSWR amplifier will considerably increase the measurement accuracy and signal-to-noise ratio.

3-5.3 Leveling

Leveling is the process which overcomes the natural tendency of RF sources to generate different power levels at different frequencies due to resonances, losses, and other frequency-sensitive factors. The desired end result is identical power level at all frequencies. Internal leveling in the 572A-17 with option M2 results in a power level at the RF OUT connector that is essentially flat over the entire frequency range.

To be most useful, leveling should be accomplished as closely as possible to the point of measurement. Where greatest measurement precision is required, external leveling may be desirable due to the effects of standing waves in the coaxial cables and frequency sensitivities in other coaxial components in a given test setup. When external leveling is used, the power level at the output of the leveler is essentially identical for all output frequencies. The front-panel SENS adjustment should be set to the position which produces the desired sensitivity (mV/mW) and best square-law response.



A. PRELIMINARY CONTROL SETTINGS

Control	Setting
POWER (1)	Maximum CCW
POWER (A)	Depressed
RF OUT (3)	Connect suitable RF output cable to circuit or device to be sweep tested
SWEEP MODE (B)	F1 - F2
MODULATION MODE (C)	CW
EXT AM (D)	OFF (OUT)
RETRACE (E)	OFF (OUT)
TRIGGER (F)	INT
SWEEP (G)	FAST

B. TYPICAL TEST METHOD

Control	Setting
BAND SELECT (H)	Set to match desired test range
F1-START (J)	Adjust so RED dial indicator is at lowest frequency of interest

Figure 3-3. Initial Operating Procedure (Sheet 1 of 3)

F2-STOP (K)	Adjust so BLUE dial indicator is at highest frequency of interest
LEVELING (6)	OFF
POWER (1)	Slowly increase the RF output of the plug-in while observing detected response of test item on display unit (oscilloscope or chart recorder)

Continue to increase the RF amplitude until the desired power level is reached. If the unit is equipped with Option M2, depress INT LEVELING (6) . If an external leveler is used, connect its input to EXT DET (4) and adjust SENS (8) for square-law response of detector. Increase power until the output becomes unleveled as indicated on the display unit trace or until UNLEVELED indicator (2) lights. Reduce setting of POWER control (1) as required.

If detected output power is flat but shows constant increase or decrease in power level with increased frequency, adjust SLOPE (7) for overall flat response.

If the shape of the swept response changes as a function of SWEEP CONTROL (L) setting, reduce sweep speed until the distortion is no longer evident. This effect may be noticed when sweeping high-Q circuits, when the crystal detector output capacitor is of high value, or when logarithmic converters are used at the display unit input. In general, use the lowest sweep speed which allows comfortable viewing of the display unit trace with minimal distortion. When the 572A-17 plug-in is used with a 540B mainframe, sweep speed is automatically reduced to eliminate distortion in output; if distortion is present, it is caused by hysteresis in swept circuit.

To use direct reading frequency markers, connect marker outputs to display unit in accordance with instructions for Model 540B, or set rear-panel MARKERS switch (M) to ON.

Adjust M1 (N) until the brightened dot on the trace is over an area of interest in the swept response curve. The frequency of the discontinuity, anomaly, or other event is shown by the GOLD dial indicator. Adjust M2 (P) to calibrate the swept response curve at a second frequency. In many cases, it will be desirable to examine parts of the trace using narrow sweeps without disturbing the F1-F2 setting:

Figure 3-3. Initial Operating Procedure (Sheet 2 of 3)

Control	Setting
M1/Fc (N)	Adjust so marker 1 is centered in the narrow band area of interest
SWEEP MODE (B)	Fc ± ΔF
ΔF WIDTH (K)	Adjust so BLUE indicator shows the desired frequency deviation about Fc (use lower part of frequency scale)
M2 (P)	Set marker 2 so GREEN indicator shows calibration frequency (use upper part of frequency scale)

C. OTHER CONTROLS

1. TRIGGER MODE (F): Trigger modes other than internal have specific uses. In line trigger mode, the effects of power ground loops or power line-frequency noise in the displayed swept response curve can be minimized by synchronizing the sweep with these components. External/manual mode is used for single sweeps or sweeps triggered on command from other measurement and test devices.

2. RETRACE (E): If a fast-rising pulse caused by turning off the RF output of the plug-in during retrace is causing distortion at the ends of the display unit trace, depress this pushbutton to leave RF on during retrace. This is also recommended if power meters are used in the system.

3. MODULATION MODE (C): Depress the 1 KHz pushbutton to amplitude-modulate the RF output for use with VSWR detectors or ratiometers.

Figure 3-3. Initial Operating Procedure (Sheet 3 of 3)

3-5.4 Power Meter Leveling

Model 572A-17 RF plug-ins with Option M7 will accept an external leveling input from a negative-output crystal detector as described in Paragraph 3-5.3 above, or may be leveled with the output of any power meter which has a 1 volt output corresponding to full scale. The slide switch inside the plug-in should be set to its M7 position for negative-output power meters (Hewlett-Packard 431B, etc.) or to its M7A position for positive-output power meters (Hewlett-Packard 432, 435, etc.). The power meter leveling circuits are activated by pulling the 572A-17 POWER control straight out from the front panel. Fast-rising or falling amplitude modulation signals will be slowed considerably in this position.

3-5.5 Band Selection

Band selection is determined by the setting of the mainframe front panel BAND SELECT switch. When this switch is set to the Band 1 position, the outputs of the band 2 and band 3 RF sources are disabled, and the solid-state RF switch is biased to allow only the output of the band 1 RF source to pass, with minimum attenuation. The action is similar when the BAND SELECT switch is set to any of the other single-band positions.

When the band switch in either unit is set to the Band 4 position, the continuous sweep circuitry of the 572A-17 is used to operate all single bands in sequence for each zero to -10 volt sweep ramp from the mainframe.

3-5.6 FM Inputs

The 572A-17 may be frequency-modulated in two ways: When the rear-panel WIDE/NARROW switch is set to NARROW, FM INPUT connector J4 feeds the fast FM coil of all oscillators in series.

A current driver is required; maximum current is + or - 1 Ampere. The shell of the FM INPUT connector is isolated from ground so that remote current sensing may be used. The sensitivity varies with oscillator frequency.

When the switch is set to WIDE, J4 feeds the (oscillator) driver boards rather than feeding the oscillator directly. A voltage source is required; sensitivity is constant at 10 MHz/volt for any frequency.

The output of a discriminator is often used to lock the output frequency of the 572A-17 to an external standard; AC-coupled audio-frequency outputs are often used when it is desirable to generate a discrete frequency or swept FM signal.

3-5.7 Display Blanking

In addition to the display blanking output described in the mainframe instruction manual, all continuous sweep RF plug-ins include a display blanking output connector on the rear panel of the plug-in.

In test situations where it is desirable to eliminate the band crossover markers as well as the sweep retrace, the 572A-17 display blanking output should be used.

3-5.8 Power Meter Measurements

If an RF power meter is being used to measure output power of the plug-in at high sweep speeds, it will indicate average power over the swept band, provided the sweep retrace is not blanked. Setting the mainframe RETRACE switch to OFF will blank the RF output during sweep retrace and cause the power meter to indicate a lower power amplitude than is actually present. The fast rising and falling voltages of the beginning and end of sweep retrace will also cause disturbances when logarithmic converters or crystal-detector type logarithmic power meters are used, causing abnormal power levels to be indicated at fast sweep speeds.

3-5.9 Slope Compensation

Under normal circumstances, the front-panel SLOPE control may be set to its extreme counterclockwise position. However, when it is necessary to compensate for losses in the higher frequency components of the RF output in long cable runs, the SLOPE control may be adjusted so that the detected leveled output is flat across the band of interest.

3-5.10 Oscillator Current Limiting

When the external tuning input capability of the 540-series mainframe is used, the maximum voltage input should not exceed -10 volts; the oscillator driver boards of the 572A-17 are factory-set to current limit at an input of approximately -12 volts. When tuning current limiting has occurred, the RF output of the plug-in will be held at its maximum rated output frequency, and further increases in tuning voltage will not cause an increase of output frequency. To reset the current limiting circuits, simply tune the frequency below the rated maximum.

Some oscillators will not have any output when they are clamped in this manner. To reset the current limiting circuits, turn off the mainframe power for at least 15 seconds before turning it back on.

SECTION IV

CIRCUIT DESCRIPTION

4-1. OVERALL FUNCTIONAL DESCRIPTION (Figure 4-1)

Figure 4-1 is a simplified block diagram of the Model 572A-17 RF Plug-in. The user is also referred to Figure 4-1 and Paragraph 4-1 of 540B instruction manual 950775, which describes the interconnections and interrelationships between the mainframe and the RF plug-in.

The RF plug-in accepts operating power, frequency-control commands and signals, and amplitude-control signals from the mainframe and generates a predictable band of microwave energy to be used for transmission and/or reflection tests of instruments, systems, or components designed for operation in the 2,000 to 18,500 Megahertz range.

4-1.1 Band Select Functions

A portion of printed circuit assembly A1 in the 572A-17 RF plug-in (this assembly is commonly called the "mother board") contains band decoding and digital band selection circuitry which translates the electrical command from the mainframe BAND SELECT switch into appropriately-timed band-switching signals which activate or deactivate the oscillator driver modules and control the RF bandswitch.

4-1.2 Tuning Amplifier Functions

Three sets of dc-coupled offset amplifiers on the "mother board" are driven by the zero to -10 volt tuning voltage output of the 540-series mainframe to produce frequency tuning signals for the individual oscillator modules in the plug-in. The tuning amplifier circuits also include a provision to prevent selection of a sweep speed in excess of the hysteresis limits of the oscillator modules (this feature is not useable in early 540 mainframes without minor modification; instructions are in Paragraph 6-3.7, Section VI).

4-1.3 Amplitude Modulation Functions

As shown in Figure 4-1, amplitude modulation signals from the mainframe (RF off, 1 kHz, retrace on/off) and external amplitude modulation signals coupled through the mainframe are summed with leveling feedback signals from the internal directional detector (Option M2) or from an external detector or power meter to control the RF output amplitude of the plug-in. Other drive signals generated within the plug-in (power, leveling mode, and slope compensation) also provide drive for the internal RF modulator.

4-1.4 Oscillator Drivers

Three similar oscillator driver printed circuit assemblies accept the frequency tuning outputs of the "mother board" tuning amplifiers, sum these voltages with externally-supplied frequency modulation (FM) voltages, when such signals are used, and provide the individual oscillator modules with regulated current-mode frequency tuning signals (V_t) and regulated voltage-mode operating or bias power (V_b). The oscillator driver modules contain circuitry to disable the oscillator modules for which they provide drive when that frequency band has not been selected; this eliminates crosstalk through the bandswitch in continuous sweep mode.

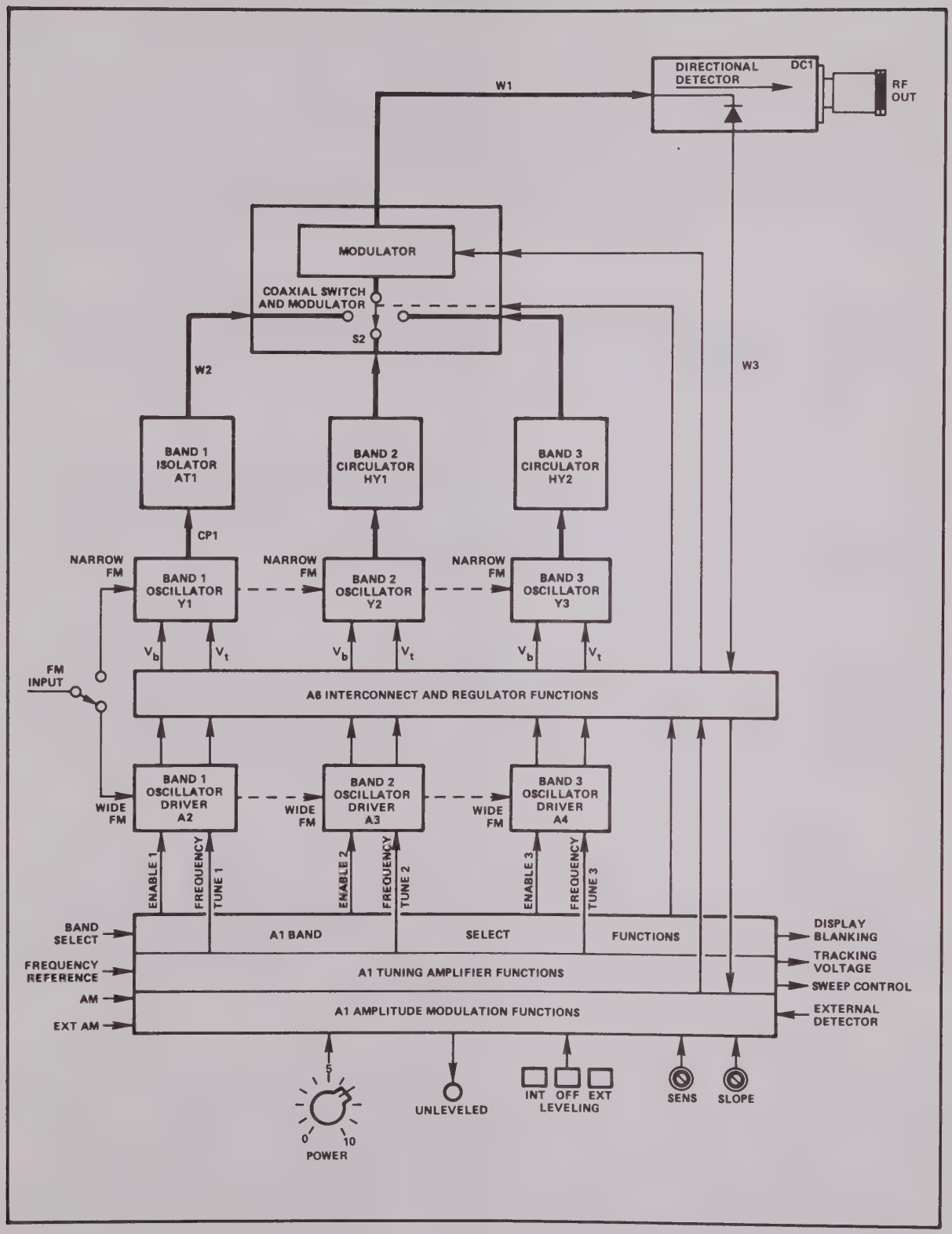


Figure 4-1. Model 572A-17 Functional Block Diagram

4-2. DETAILED FUNCTIONAL DESCRIPTIONS

4-2.1 RF Circuits (Figure 4-1)

4-2.1.1 OSCILLATORS. The oscillator modules used in the 572A-17 are YIG-tuned sources of all solid-state design and construction. The oscillators are tuned to the desired frequency by passing a current through an electromagnet coil surrounding a sphere of YIG (yttrium-iron-garnet) material which has been doped with impurities.

The magnetic flux generated by the tuning coil aligns the poles of the YIG sphere; once the material has been magnetically saturated, it can be tuned to resonate at different frequencies at a rate of some 2.8 MHz per Gauss (one Maxwell per square centimeter). This uniform precessional mode, as it is known, is defined as the condition in which the magnetic moments of all atoms in the YIG crystal are parallel and precess in phase about the uniform magnetic field.

In practice, each oscillator module incorporates two tuning coils: a smaller tuning coil, which also surrounds the YIG sphere, is used for fast frequency modulation over narrow bandwidths. The main tuning coil sets the frequency output over the entire operating band of the oscillator. Once the YIG material has been saturated, it tunes linearly with applied electromagnet current. This results in a device which can be tuned predictably and linearly as a function of an external drive.

Band 1. The Band 1 oscillator module is an ultra-wideband unit covering the two-octave range of 2 to 8 GHz. The active oscillator element is a microwave transistor; the YIG sphere acts as the resonant tank circuit for the transistor, tuning it to the desired output frequency. The output of the transistor is coupled through the YIG sphere to an integral tracking amplifier which increases the output amplitude to a useable level. The tracking amplifier is also tuned by a YIG sphere which sits within the same magnetic environment as that of the oscillator. A second, smaller tuning coil is used to fast frequency-modulate the output.

Band 2. The band 2 oscillator, covering the 7.9 to 12.5 GHz band, uses a Gunn-effect diode as its oscillator element. The Gunn diode is tuned to frequency by varying the load impedance into which its output is coupled. The magnetically-saturated YIG spnere acts as a variable impedance load, tuned by the magnetic saturation of the sphere.

Band 3. The 12.3 to 18.5 GHz band 3 oscillator operates similarly to the Band 2 oscillator described in the paragraph above.

4-2.1.2 ISOLATING DEVICES. The output of each oscillator in the plug-in is coupled through an isolating device which prevents damage to the oscillator element or distortion of the output signal which could result from mismatched load impedances (high VSWR) at the RF OUT connector of the plug-in, or caused by reflection of energy from the bandswitch/modulator.

Band 1. The output of oscillator Y1 is coupled through a ferrite isolator to bandswitch/modulator S2. An isolator allows microwave energy to be passed through in one direction with a loss of less than 1 dB, but absorbs power reflected back from a mismatched load or power coupled into the plug-in from an external source.

Bands 2 and 3. The outputs of oscillators Y2 and Y3 are fed through circulators; a circulator is a multi-port device arranged so that energy entering one port is transferred

to the next adjacent port in one direction. Energy reflected back into the output port from an external mismatched load is coupled into a 50Ω termination rather than being coupled back into the energy source. These devices produce more than 20 dB of source-to-load isolation with a loss of less than 1 dB.

4-2.1.3 BANDSWITCH/MODULATOR. A three-input, voltage-controlled attenuator is used as a bandswitch and modulator. This device uses PIN diodes in both series and shunt configurations. The series PIN diodes block RF energy when they are correctly biased, while the shunt PIN diodes direct RF energy to ground as a means of attenuation.

The PIN diode is manufactured so that a thin intrinsic region separates the P material from the N material. The storage time of the PIN diode is relatively long, so it does not rectify at microwave frequencies. Instead, it behaves as a variable resistance controlled by a dc current through the diode.

The device is biased to accept energy from only one input at a time; the amount of absorption or reflection of the modulator is controlled by the RF plug-in's amplitude modulation circuits.

4-2.1.4 DIRECTIONAL DETECTOR. RF plug-ins ordered with Option M2 are fitted with an internal directional detector covering the complete 2 to 18.5 GHz range of the plug-in; this device is used in conjunction with the amplitude modulation circuits of the plug-in and bandswitch/modulator S2 to cause the output amplitude of the plug-in to be essentially identical at any frequency.

The directional detector comprises a directional coupler with an integral microwave crystal detector and square-law load. The directional coupler consists of two coaxial sections coupled together such that a traveling wave in the main line will induce a traveling wave in the same direction in the other line. The coupled output is approximately 13 dB below the amplitude of the main line; the directivity of the coupler is about 22 dB. Therefore, the leveling circuitry is isolated from and does not interfere with the 50 Ω transmission line in the output.

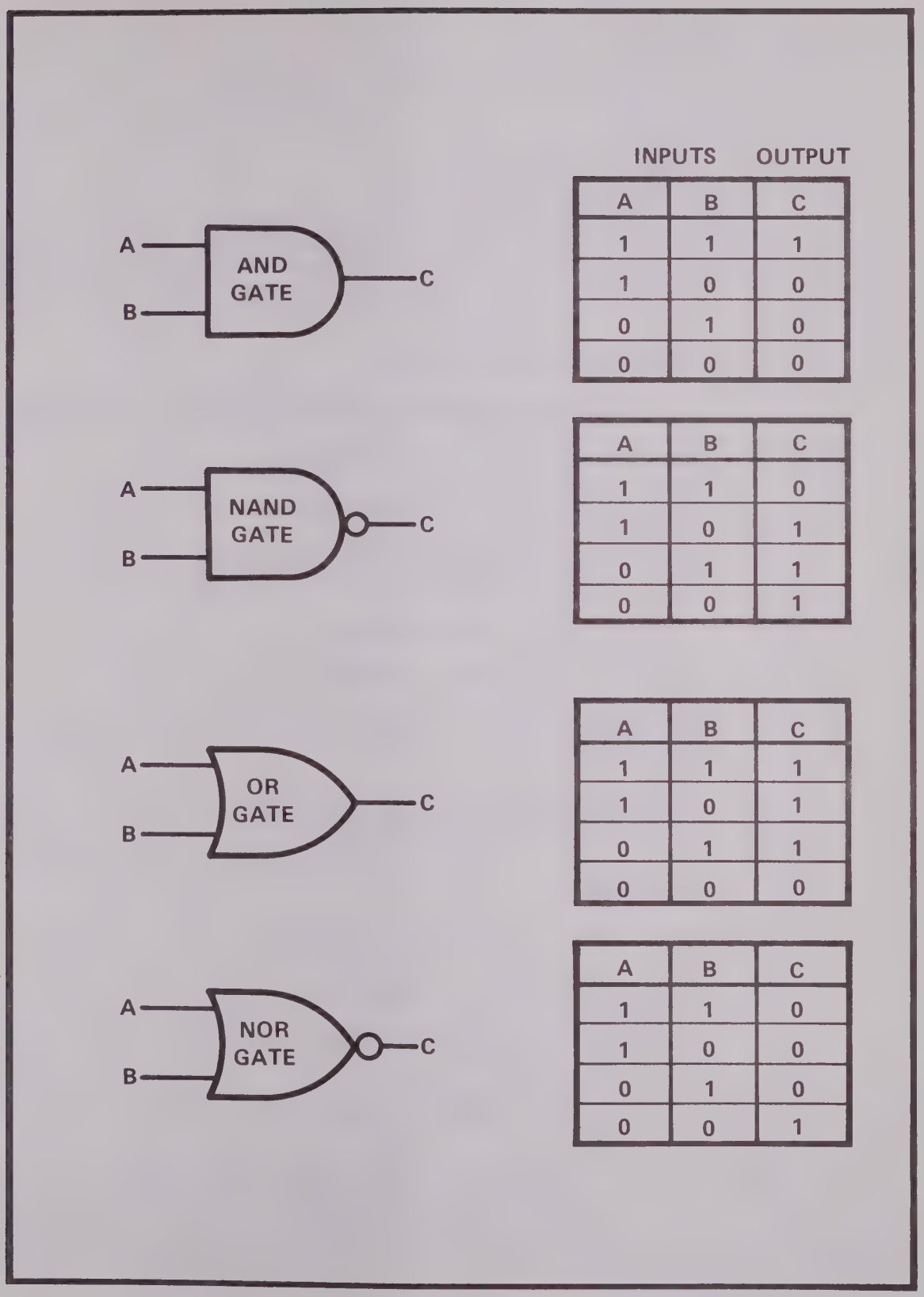
4-2.1.5 BAND 1 OPERATION. When Band 1 is selected, oscillator driver A2 is supplied with an enabling command to provide operating power (bias voltage, or V_b) to oscillator Y1. The RF output of Y1, approximately 10 mW (+10 dBm) minimum, is fed through isolator AT1 to the bandswitch/modulator, S2. This device is biased to accept input only from AT1 through coaxial cable W2. As the other two oscillators are not enabled when band 1 is selected, there are no other inputs to the bandswitch.

4-2.1.6 BAND 2 OPERATION. When oscillator Y2 is active in band 2 mode, its RF output of approximately 20 to 50 mW (+13 to +17 dBm) is coupled through circulator HY1 and bandswitch/modulator S2 to the RF OUT connector.

4-2.1.7 BAND 3 OPERATION. The output of oscillator Y3 is approximately 20 to 40 mW (+13 to +16 dBm); this output is coupled through HY2, S2, W1, and DC1 (if so equipped) to the RF OUT connector, J6.

4-2.2 Mother Board Logic (Figure 4-2)

TTL (transistor-transistor logic) devices are used exclusively as digital circuit elements in the 572A-17. A logical "1" (true, high) is represented by a voltage level between +2.8



INPUTS OUTPUT

A	B	C
1	1	1
1	0	0
0	1	0
0	0	0

A	B	C
1	1	0
1	0	1
0	1	1
0	0	1

A	B	C
1	1	1
1	0	1
0	1	1
0	0	0

A	B	C
1	1	0
1	0	0
0	1	0
0	0	1

Figure 4-2. Gate Logic Truth Tables

and +5.0 volts dc. A logical "0" (false, low) is represented by a voltage level between 0 volts and +400 millivolts.

Figure 4-2 shows representative devices used in the plug-in and the accompanying truth table for each type of gate.

4-2.3 Band Select Functions (Figure 4-3)

4-2.3.1 GENERAL. RF plug-in band selection is controlled by the 540-series mainframe BAND SELECT rotary switch, which is mechanically linked to the dial drum. Rotation of the BAND SELECT knob causes the appropriate portion of the dial drum to come into view and simultaneously provides an electrical band select command to the plug-in.

Input signals to the band select circuits include:

1. Contact closure to ground from the mainframe for band selection.
2. Slow sweep reference from the mainframe.
3. Blanking (sweep retrace) reference from the mainframe.
4. Band crossover inputs from the tuning amplifier circuits, used in continuous sweep mode (band 4).

Output signals from the band select circuits include:

1. Oscillator enabling signals to the oscillator drivers.
2. Band select commands to the drive circuitry for the PIN diode bandswitch/modulator.
3. Relay enabling command to the tuning circuits to switch from single-band to continuous sweep mode of operation.
4. Off command to AM circuits during band changeover and retrace (slow sweep mode).
5. Display blanking to rear-panel connector J2.
6. Sweep stop command to mainframe sweep circuits.
7. Range switching command to the tracking voltage amplifier in continuous sweep mode of operation.
8. Unleveled detector disable command during band changeover and retrace.

4-2.3.2 SINGLE BAND OPERATION. When any of the single bands -- 1, 2, or 3 -- has been selected, the band 4 select line is high, at logic "1" level. The band 4 select line is shown on the logic/block diagram running between diode CR37 and gate IC15B. This provides a "1" to one input of each upper AND gate in IC13B, IC13A, and IC15A. This "1" is inverted by IC14F to provide a "0" to each lower AND gate IC13B, IC13A, and IC15A.

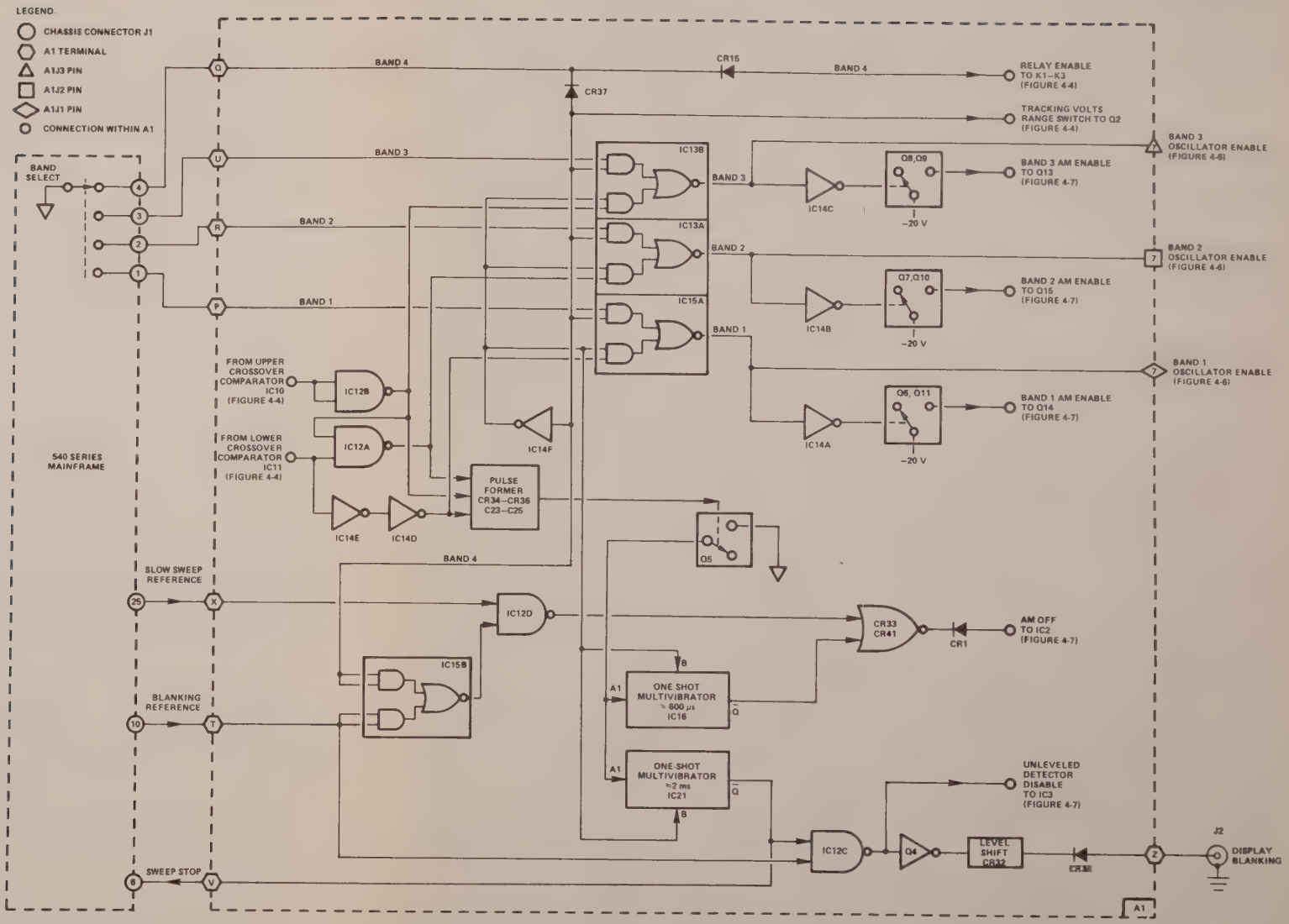


Figure 4-3. Band Select Functions Simplified Schematic Diagram

The "0" from IC14F also disables multivibrators IC16 and IC21, because the sweep stop, AM off, and display blanking functions are not used in single band mode.

Band 1. Refer to gate IC15A on the diagram; when band 1 is selected, the inputs to the upper AND gate are "0" and "1", so its output is "0". The inputs to the lower AND gate are "0" (from IC14F) and "0" or "1" from IC14D. In either case, the output of the lower AND gate is "0"; with two "0" inputs, the NOR gate output is "1", and band 1 is selected:

1. The "1" output of band 1 selector IC15A provides an oscillator-enabling command to oscillator driver A2.

2. The "1" output of IC15A, inverted by IC14A, closes switch Q6/Q11 to provide an enabling command to AM driver Q14.

Band 2. Selecting band 2 causes the output of IC13A to go to "1", while the band 1 output of IC15A and the band 3 output of IC13B are at "0":

1. The "1" output of band 2 selector IC13A enables oscillator Y2 through oscillator driver A3.

2. The "1" is inverted by IC14B to close switch Q7/Q10, enabling band 2 and driver Q15.

Band 3. The output of IC13B goes to "1" when band 3 is selected:

1. The "1" enables oscillator Y3 through driver A4.

2. AM driver Q13 is enabled through Q8/Q9.

4-2.3.3 CONTINUOUS (BAND 4) OPERATION. When the bands are to be scanned consecutively during a single sweep cycle, the band 4 select line goes to "0" and the output of IC14F goes to "1". The determination of which band is selected will depend upon the output states of band decoders IC12A and IC12B driven by the crossover comparators in the tuning amplifier circuits. In single band mode, band 1 switch logic input states (reading from top to bottom as drawn in Figure 4-3) of 0-1-0-1 or 0-1-0-0 were required to yield a "1" output from the NOR gate. In continuous sweep mode, input states of 1-0-1-0 are needed.

Band Selection. At the beginning of sweep, the outputs of both crossover comparators are "0". This condition yields a "1" at the output of IC12B and a "1" at the output of IC12A; only band 1 gate IC15A will have a "1" output. When lower crossover comparator IC11 changes its output state to "1", only the band 2 gate will have a "1" output. Band 3 is selected when both crossover comparators have changed to "1" outputs.

Sweep Stop. Band switching in continuous sweep mode is performed while the frequency-determining sweep ramp is stopped and held; this prevents switching transients from appearing in the RF output and ensures that there are no "dead" spots or missing bands of frequencies.

Each change of state in the crossover comparators is detected and differentiated by the pulse former, which triggers switch Q5; this transistor, in turn, triggers one-shot multivibrator IC21. The $\overline{Q}$ output goes to "0", stopping the upward progress of the sweep ramp in the mainframe sweep circuits. After $\approx$ 2 ms, IC21 times out and the sweep ramp resumes its progress.

Display Blanking. A -6 volt level is available at the rear panel DISPLAY BLANKING connector to blank or disable external CRT displays or chart recorders during band crossover transitions and sweep retrace.

Multivibrator IC21 provides a 2 ms "0" to one input of NAND gate IC12C at each band crossover; the other input to IC12C at this time is a "1", so the output of IC12C is a "1"; this is inverted and shifted by transistor Q4 and Zener diode CR32. During sweep retrace, the blanking reference from the mainframe is "0" and the input from IC21 is a "1", yielding a -6 volt blanking output from Q4. Diode CR30 ensures that only negative levels are transmitted to J2.

AM Off. The RF output levels of the oscillators are attenuated during band crossovers by coupling the AM off pulse to the AM circuits. One-shot multivibrator IC16, triggered at transition points by Q5, feeds a 600 μs-wide pulse through diodes CR41 and CR1 from its $\overline{Q}$ output. After the multivibrator has timed out, the AM circuits are again enabled. However, the sweep is still stopped; this allows sufficient time for the output levels to settle before the sweep is started some 1.4 ms later.

The blanking reference is also used to reduce the oscillator amplitude during sweep retrace; gate IC15B receives four "0" inputs during sweep retrace in band 4. Its output to NAND gate IC12D is a "1". If the slow sweep reference from the mainframe is not present, IC12D couples an AM off pulse through diodes CR33 and CR1 to the AM circuits.

This is not desirable when chart recorders are used because of their inability to respond to the fast-rising pulses which would result during sweep retrace. Consequently, the retrace AM blanking is disabled whenever the mainframe SLOW SWEEP switch is depressed.

4-2.4 Tuning Amplifier Functions (Figure 4-4)

4-2.4.1 SINGLE BAND OPERATION. When the mainframe BAND SELECT switch is set to any of the single band positions -- 1, 2, or 3 -- the frequency reference signal from the mainframe is coupled through the normally-closed contacts of reed relays K1, K2, and K3 to the inputs of oscillator driver boards A2 (band 1), A3 (band 2), and A4 (band 3). The zero to -10 volt input from the sweeper mainframe is not modified in any way by the tuning amplifiers.

4-2.4.2 CONTINUOUS (BAND 4) OPERATION. When the BAND SELECT switch is set to band 4 position, a ground command from the band select circuits activates relays K1 through K3, selecting the outputs of tuning amplifiers IC4 through IC6 as tuning voltage sources for the oscillator drivers.

Inverter IC7 acts as differential line receiver for the tuning reference from the mainframe; by keeping the frequency reference return separate from the digital and linear ground paths in the plug-in, incidental frequency modulation of the RF output is kept to a minimum. IC7 operates with a gain of -1, providing a zero to +10 volt tuning input to IC4 through IC6. These tuning amplifiers invert the frequency reference signal again, operating with a maximum gain of about -3. An adjustable dc offset voltage is summed into each tuning amplifier to set the minimum output voltage, and consequently the oscillator starting frequency. The gain of each amplifier is set to determine the maximum output voltage, hence the oscillator stop frequency. A clamp voltage of $\approx$ 11 volts applied to each tuning amplifier keeps its output from exceeding the allowable maximum input to the oscillator driver. With reference to schematic diagram Figure 8-3, note that Zener diode CR20 provides a regulated -11 volts to the anode of diode CR7. When the

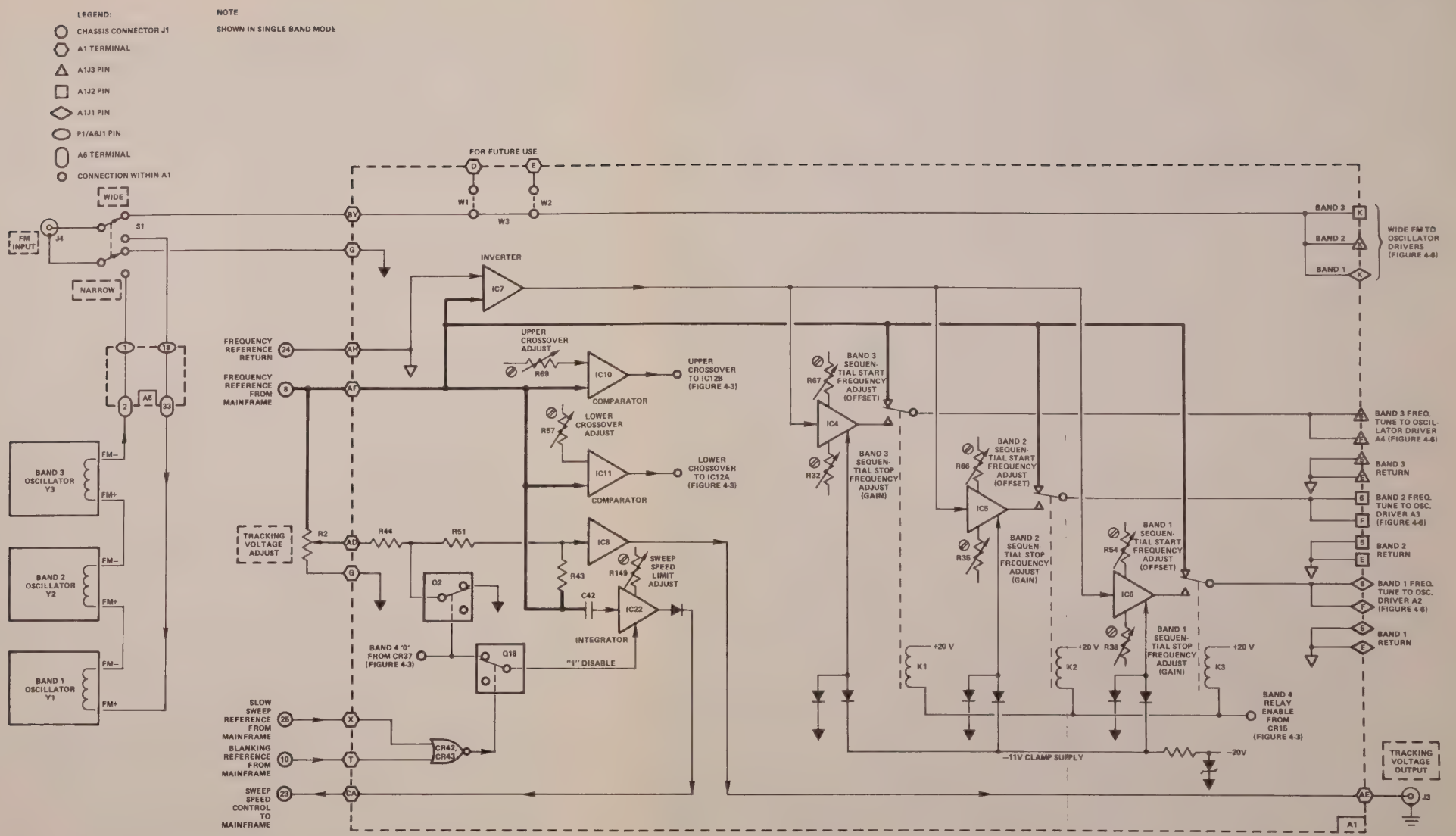


Figure 4-4. Tuning Amplifier Simplified Schematic Diagram

output voltage of IC6 reaches -11 volts, diode CR7 is forward biased and clamps the output of the amplifier to prevent further output swings. Diode CR19 in this circuit prevents the output of IC6 from going positive by clamping any output over +600 mV to ground.

The offset voltages and gain adjustments for tuning amplifiers IC4 through IC6 are set so that each amplifier responds to only a portion of the zero to +10 volt tuning input from IC7; band 1 amplifier delivers a zero to -11 volt ramp to the band 1 oscillator driver during the portion of the input ramp from zero to ≈ -3.6 volts; IC5 goes from zero to -11 volts during the -3.5 to -6.2 volt portion of the ramp. Finally, band 3 amplifier IC4 delivers a zero to -11 volt output ramp in response to a -6 to -10 volt input from the mainframe (ignoring the inversion by IC7).

The timing relationships between the input ramp, the individual output ramps, and other signals within the continuous sweep circuitry is shown in timing diagram Figure 4-5.

Crossover Comparators. Voltage comparators IC10 and IC11 are adjusted to change output state from "0" to "1" at the tuning voltages corresponding to the band 1/band 2 changeover at 8 GHz and the band 2/band 3 changeover at 12.4 GHz.

When the output of IC11 goes high at the lower (band 1/band 2) crossover, it causes the band select circuits to switch from band 1 to band 2 (refer to Paragraph 4-2.3.3 for a description of the band switching logic functions). At the upper crossover point, the output of IC11 remains high and the output of IC10 changes state from low to high. Both comparators are reset to a low output state during sweep retrace when the frequency reference voltage from the mainframe drops below ≈ 3.5 volts (or in CW and Fc ± ΔF modes when the tuning voltage drops below this amplitude).

4-2.4.3 TRACKING VOLTAGE OUTPUT. Amplifier IC8 samples the frequency reference input voltage to the tuning circuits and generates an output voltage proportional to frequency through the rear-panel TRACKING VOLTAGE connector. In the single-band operating mode, this output is limited to a maximum of +5 volts as the amplifier's positive input is referenced to ground through transistor switch Q2. In continuous sweep mode, switch Q2 is opened and the maximum output level is set (to a maximum of +15 volts) by rear-panel TRACKING VOLTAGE ADJUST potentiometer R2.

4-2.4.4 SWEEP SPEED LIMIT. In order to ensure that the output frequency of the plug-in is not tuned faster than the YIG-tuned oscillators and amplitude modulation circuits can accommodate without causing distortion of the output waveform, integrator IC22 samples the frequency reference input voltage to the tuning circuits and delivers a positive voltage to the sweep circuitry of the mainframe to prevent further increases in sweep speed.

With reference to schematic diagram Figure 8-3 in Section VIII, note that the input ramp is differentiated by capacitor C42 and coupled to IC22; IC22 charges C44. The output of IC22 becomes increasingly positive until approximately 600 millivolts appears across diode CR46, at which point resistor R151 is switched across IC22, and its output rises as the sweep rate increases. Diode CR47 ensures that only positive voltages are coupled to the sweep control input of the mainframe.

Excessive sweep speed can occur only in the continuous (band 4) mode where the tuning rate at the fastest sweep speed could exceed 300 octaves per second over the 2 to 18 GHz range. The sweep speed limit circuit is disabled in single band mode by delivering a "1" through transistor switch Q18 to IC22. IC22 is disabled in slow sweep mode by opening

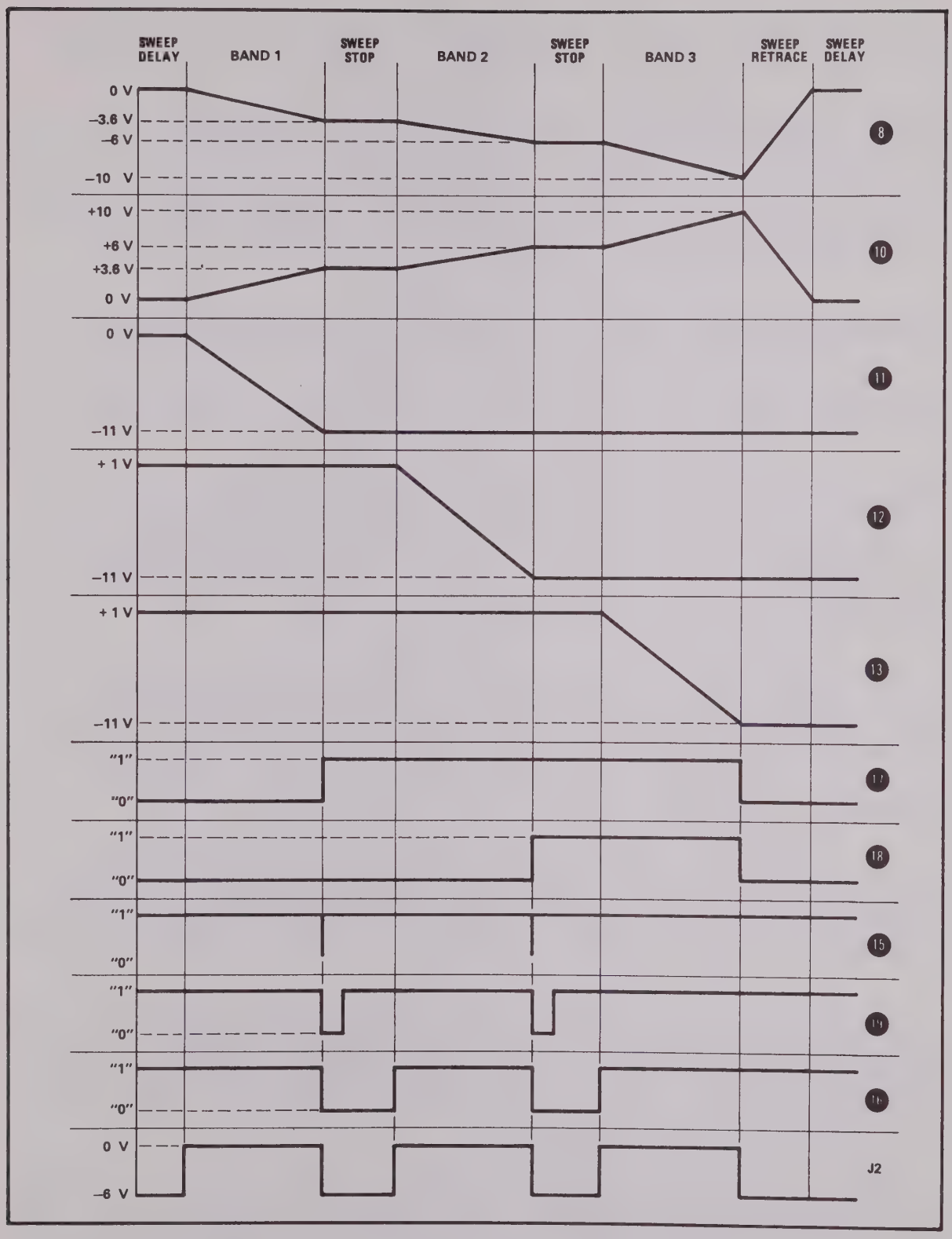


Figure 4-5. Multiband Sweep Timing Diagram

Q18 through an OR gate comprising diodes CR42 and CR43. Finally, IC22 is disabled through CR42/CR43 and Q18 during sweep retrace. Because sweep retrace is approximately 10 times the fastest forward sweep speed, the tuning rate can exceed 3000 octaves per second. However, measurements are normally not made during sweep retrace, and it is not considered necessary or desirable to limit retrace speed. The effect can be noted during fast continuous band sweeps when the RETRACE switch of the mainframe is at ON -- the retrace presentation on the oscilloscope will be somewhat displaced from that of the forward trace, a typical output waveform distortion.

4-2.4.5 FM TUNING INPUTS. An external frequency-modulation signal can be coupled from J4 through S1 directly to the auxiliary YIG tuning coil in each of the three oscillators. As shown in Figure 4-4, the coils are wired in series with a total dc resistance of about 2 Ω. The frequency output of oscillator Y1 is reduced 300 kHz for each milliampere of negative drive or increased 300 kHz for each milliampere of positive drive. Oscillators Y2 and Y3 are tuned at a rate of 150 kHz per milliampere, and are similarly sensitive to the polarity of the input.

When switch S1 is set to WIDE, the FM input signal is coupled to the three plug-in oscillator driver boards in parallel. The sensitivity is constant: the output frequency of the activated oscillator is decreased by 10 MHz for each input volt; the input impedance is 10 kΩ. Model 572A-17 plug-ins are normally shipped with jumper wire W3 soldered in place; if it is necessary for some specific application to change the tuning sensitivity of the wide FM input, jumper W3 can be removed and jumpers W1 and W2 installed. A user-designated resistor, voltage divider, or network can be installed across board pins D and E to modify or shape the input to the oscillator driver boards.

4-2.5 Oscillator Drivers (Figure 4-6)

The three YIG-tuned oscillators used in the 572A-17 are inherently linear, but require operating and tuning drive currents in excess of 1 Ampere. The plug-in oscillator driver boards are used to provide operating power to the oscillators and to convert the frequency reference voltage from the tuning amplifier circuits into current drive for the main tuning coil in each oscillator. Each oscillator driver also contains protective circuitry for the oscillator element and tuning circuits.

NOTE

The connector pin number and A6 component reference designators shown in Figure 4-6 apply to band 2 (8 to 12.4 GHz) operation using oscillator module Y2.

4-2.5.1 OPERATING POWER. A programmable remote-sensing power supply comprising an integrated-circuit error amplifier, pass transistor and driver, and protective devices provides operating power (bias voltage, V_b) for the active oscillator element in the oscillator module. The required V_b level is determined by the output of operational amplifier IC2, based upon the levels of the four inputs to IC2:

1. V_b sensing feedback from the oscillator module through Interface Board A6 and voltage divider R17/R16 into the inverting summing junction.

2. A high positive voltage through resistor R1 transistor switch Q1, and diode CR1 into the inverting summing junction.

3. A programming input from tuning summer/inverter IC1 into the inverting summing junction

4. An offsetting bias from a stable 6.2 volt reference through variable resistor R4 into the non-inverting summing junction.

These inputs are summed together in IC2, which delivers a positive-polarity output drive to transistor Q2; Q2 provides the base current drive for pass transistor A6Q4 mounted to the heatsink of interface board A6. The pass transistor, in turn, provides operating voltage from the +20 volt supply for the oscillator module. The oscillators used in the 572A-17 require a stable, well-regulated voltage source; different oscillator modules, though bearing the same manufacturer's model number, will probably require different operating voltages. This voltage is usually specified on the nameplate label or on a test data sheet supplied with the module. The range of voltages varies from less than 9 to more than 15.

Overvoltage and Reverse Polarity Protection. The operating voltage at the oscillator V_b terminals, in addition to being coupled into the error amplifier, is also fed to the protective circuitry of the oscillator driver. Should the V_b level become negative, through malfunction of a component or connection error during test or troubleshooting operations, diode CR8 will short-circuit the negative voltage directly to ground and drive the power supply of the 540-series mainframe into its current-limiting mode to reduce the applied V_b to zero.

The V_b level is limited to the reverse-avalanche level of Zener diode CR5; this diode is selected at test for a voltage approximately 1.5 volts above the highest level required by the oscillator. Should the V_b reach this limit, through malfunction of IC2 or test connection error, current will flow through CR5 and R21 to ground. The voltage developed across R21 will fire silicon-controlled rectifier (SCR) CR4 to reduce the output of IC2 to zero and turn off driver Q2. The SCR will not open until mainframe power is turned off.

The oscillator module itself is fitted with a selected Zener diode for further overvoltage protection; this diode is internal in some oscillators and visible on external terminals in others. This diode prevents destruction of the oscillator element in the event of a malfunction in driver Q2 or pass transistor A6Q4 by acting as a short circuit and driving the mainframe power supply into its current-limiting mode.

Programming. In order to obtain optimum oscillator performance, the V_b level is programmed over the swept frequency range. In the case of Band 2 and Band 3 oscillator modules, the programming is utilized to obtain the highest output power over the widest frequency range possible. These Gunn-diode oscillators require a higher low-frequency V_b than the V_b used at the high frequencies to achieve optimum power output over the band.

A portion of the inverted (0 to +10 volt) tuning voltage output of summer/inverter IC1 is coupled through resistor R15 to the inverting summing junction of IC2. At the lowest operating frequency, the frequency reference input voltage is near zero; consequently, the output of IC1 is zero. As the tuning voltage (V_t) from the 572A-17 tuning circuits increases (to a maximum of -10 volts), the output of IC1 increases (to a maximum of +10 volts). Current is coupled through R15 into the inverting summing junction of IC2, which reduces the output of IC2 and consequently reduces the V_b level as the tuning drive of the oscillator increases.

Programming is used in Band 1 to reduce the harmonic content of the oscillator's output signal. To accomplish this, it is necessary to increase the V_b with increasing V_t.

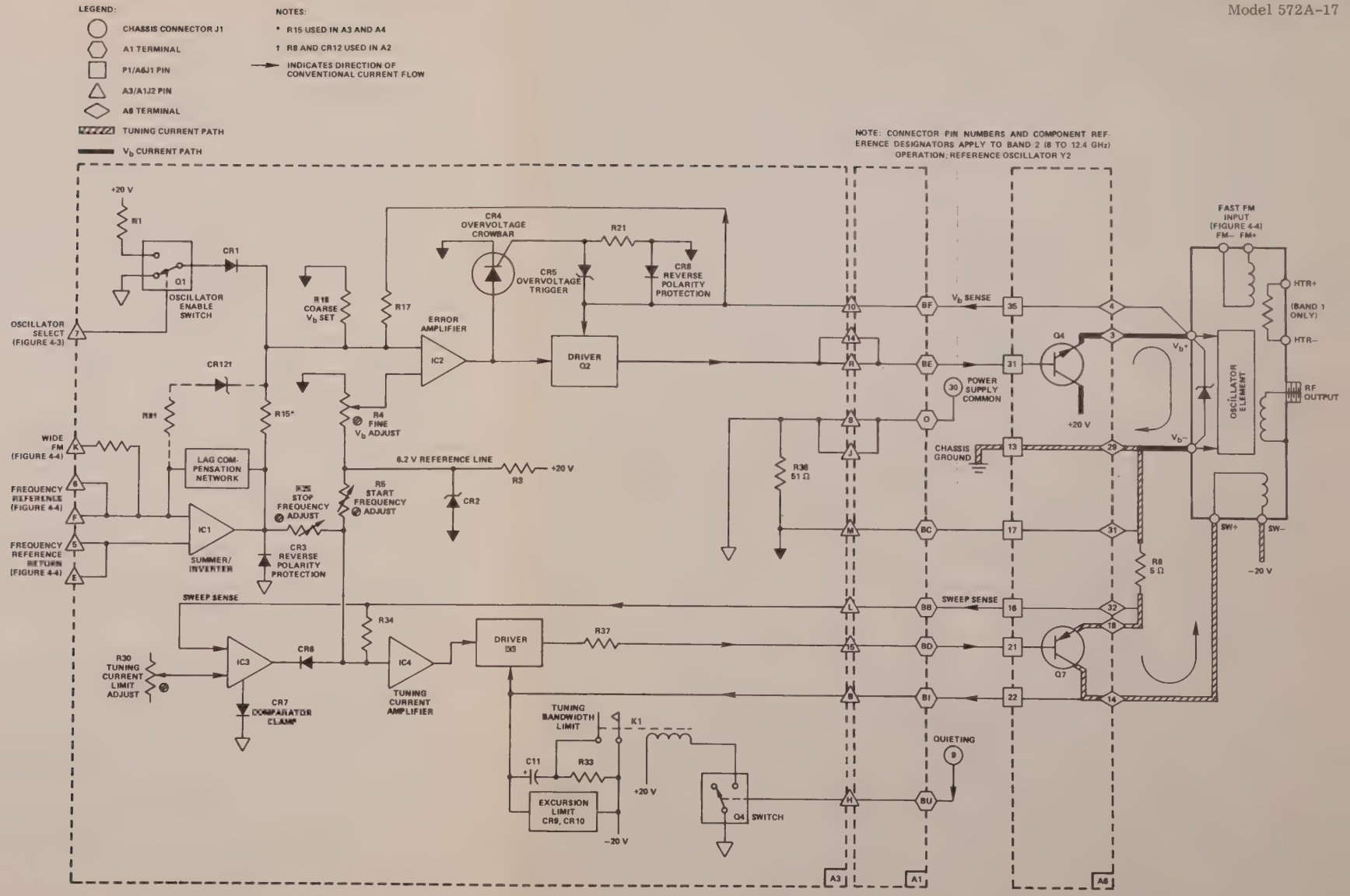


Figure 4-6. Oscillator Drivers Simplified Schematic Diagram

Programming resistor R8 is connected directly to the negative-going frequency reference input of IC1. As this negative input to the inverting summing junction of IC2 is increased, the positive output of IC2 rises to increase the V_b at the oscillator terminals. Zener diode CR12 is used as a holdoff device; until the tuning or frequency reference input voltage reaches its reverse avalanche level, no current is allowed through R8 to IC2. From a tuning input of zero to about -5 volts (corresponding to frequencies of about 2 to 5 GHz), the V_b level is constant. From about -5 to -10 volts (5 to 8 GHz), programming current through R8 and CR12 raises the V_b from its starting level of about +10 volts to a maximum of about +15 volts.

Oscillator Selection. In order to enable oscillator operation, a "1" logic level from the band select circuits is applied to transistor switch Q1, connecting the anode of diode CR1 to ground. When the oscillator is not specifically selected, a "0" level keeps switch Q1 open. Current is coupled from the +20 volt supply through R1 and CR1 into the summing junction of IC2, reducing its positive output to a very low level and preventing operation of the oscillator. (Ancillary oscillator circuits such as heaters are not affected when the V_b is reduced below operating level.)

4-2.5.2 FREQUENCY TUNING. The frequency reference output of the tuning amplifier circuits (Paragraph 4-2.4) is differentially coupled to operational amplifier IC1 of the oscillator driver; this device is connected as an inverting current summer operating with a voltage gain of -1. The differential connection assures that any common mode noise -- unwanted signals appearing on the frequency reference input and on the return -- are ignored. This considerably reduces the effect of line-frequency and other extraneous conducted or radiated emissions upon the output frequency of the driven oscillator. A decade voltage divider network is used between the wide FM input to the oscillator driver and the summing junction of IC1. The wide FM input has a constant sensitivity of 10 MHz per negative volt (or -10 MHz per positive volt) to the band edges. The main tuning input has a sensitivity of 600, 460, and 620 MHz per volt, respectively, in bands 1, 2, and 3.

A lag compensation network in the feedback loop around IC1 compensates for the electrical lag inherent in the inductance of the oscillator main tuning coil. Diode CR3 prevents the output of IC1 from becoming more than 600 millivolts negative in the event a positive-polarity tuning signal is connected to the frequency reference input through malfunction in the tuning amplifier circuits or accidental connection of a positive signal in external tune mode.

Tuning Amplifier. Operational amplifier IC4, driver transistor Q3, and the tuning current pass transistor on interface board A6 form a voltage-to-current amplifier which drives the main tuning coil in the oscillator. The amplifier is capable of delivering currents greater than 1 Ampere, and operates in a closed loop. Tuning current flows from the return of the -20 volt supply through a tuning current sense resistor and pass transistor (R8 and A6Q7 in Figure 4-6) to the SW+ (or V_t+) terminal of the oscillator; current flow continues through the tuning coil to the -20 volt supply.

The voltage developed across the sense resistor (R8) is applied as feedback to tuning amplifier IC4. The current through the tuning coil (and consequently the operating frequency of the oscillator) is determined by the algebraic sum of the current values into the summing junction of IC4:

1. Start frequency (dc offset) from the 6.2 volt reference line through variable resistor R5

2. Stop frequency (upper dc limit) from the inverted tuning input through variable resistor R25

3. Feedback from the tuning coil through resistor R34

Tuning Current Limit. If the sensed tuning current exceeds a predetermined limit set by variable resistor R30, comparator IC3 will change state and hold the tuning current amplitude to its maximum allowable value. This action prevents the oscillator from being driven beyond its normal operating band by transients or excessive external FM input levels. Some oscillators may be driven into a "locked" mode where the RF output is reduced to zero. In that case, the circuitry may be reset by turning off the mainframe power switch, waiting about 15 seconds, then turning the power back on.

Quieting. When the sweeper is operated in a non-swept mode -- CW or manual sweep -- a quieting input from the mainframe activates transistor relay driver Q4 and relay K1 to place RC network C11/R33 across the output of tuning current amplifier IC4/Q3/A6Q7. This reduces the tuning bandwidth of the amplifier to less than 10 Hz, reducing incidental noise and residual FM in the RF output.

4-2.6 Amplitude Modulation Functions (Figure 4-7)

The output amplitude of the RF plug-in is controlled by bandswitch/modulator S2; the general operating principles of this device were described in Paragraph 4-2.1.3. Drive current for the PIN diodes is provided by transistors Q14 (Band 1), Q15 (Band 2), and Q13 (Band 3). A drive input of approximately +3.5 volts will cause the PIN diodes for any of the three RF inputs to fully attenuate the input signal: the shunt diodes will be turned completely on while the series diodes will be back-biased off. A drive level of approximately -4.5 volts to the PIN diodes allows the RF input at a given port to pass with minimum attenuation.

Each of the drive transistors cited above has two inputs:

1. A band enable command from the band select circuits (Paragraph 4-2.3)

2. An amplitude modulation drive through an isolating diode from AM driver IC2

4-2.6.1 OPERATING MODES. Three modes of operation are available, as set by the front-panel LEVELING switches: leveling off, internal leveling, and external leveling. A (generally undesired) fourth mode can occur if the leveling feedback loop is broken, usually by selection of the external leveling mode when no external leveling devices are connected.

Leveling Off Mode. The simplest amplitude control configuration exists when the LEVELING OFF switch is depressed, as shown in Figure 4-7. Up to five amplitude control signals are summed into the current summing junction of IC2:

1. Output power control from front-panel POWER potentiometer R5

2. 1 kHz square-wave modulation or an RF OFF dc level from the mainframe through R4

3. External amplitude modulation signals coupled through the mainframe and through R3

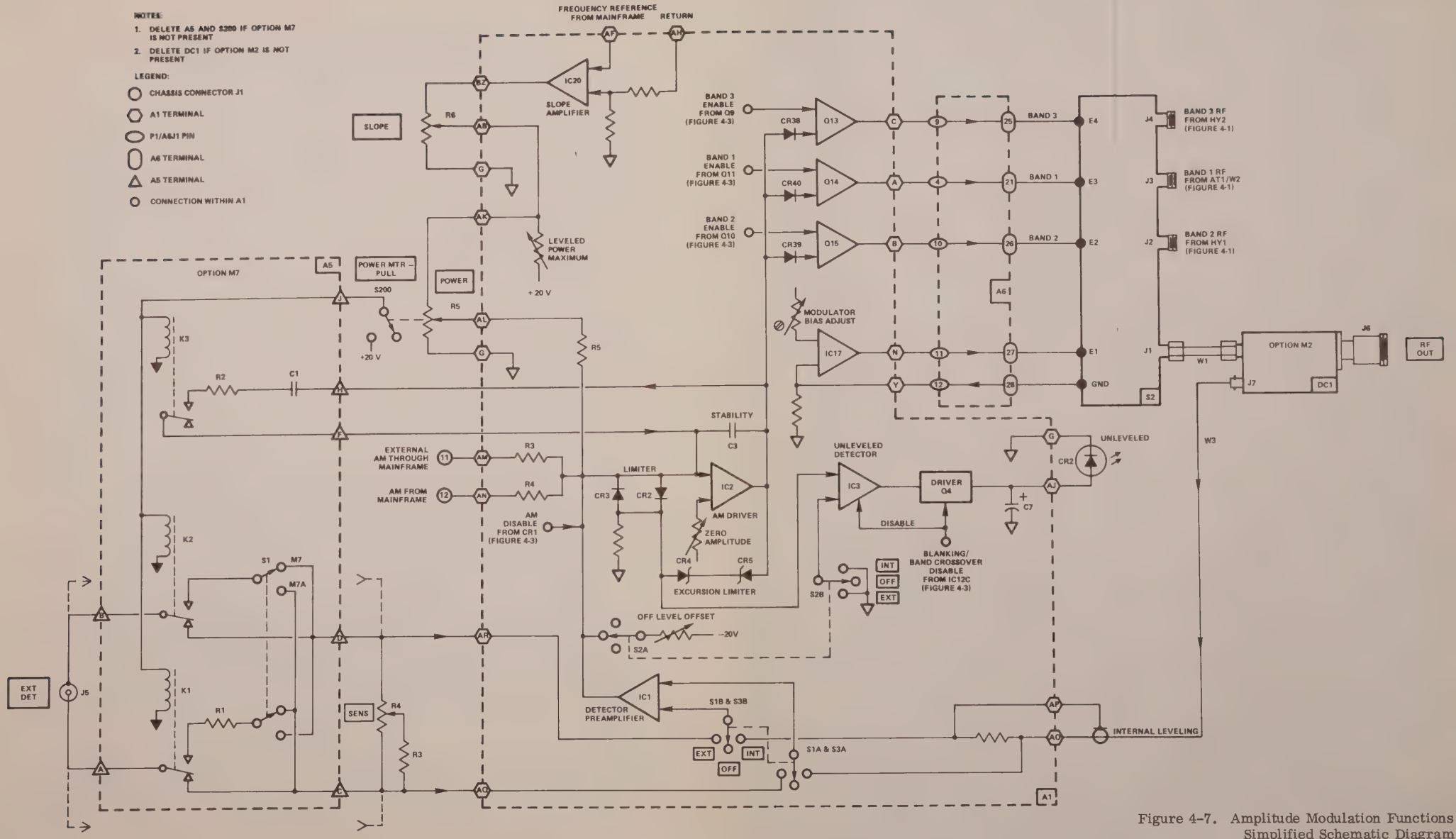


Figure 4-7. Amplitude Modulation Functions Simplified Schematic Diagram

4. An AM disable pulse from the plug-in band select circuits to disable the amplitude control functions during band crossover transitions in continuous sweep mode (refer to Paragraph 4-2.3)

5. The output of amplifier IC1 in leveling off mode (the input to IC1 is disconnected by leveling switches S1 and S3)

In the leveling off mode, voltage gain and dc offset of AM driver IC2 is set by a factory-selected resistor network connected from the -20 volt supply to the amplitude summing junction through switch section S2A. Diodes CR2 and CR3 act as an input limiter, short-circuiting input voltages in excess of + or -600 millivolts. Zener diodes CR4 and CR5 are connected as an output limiter and set the positive and negative excursion limits to + or -5.6 volts, the reverse avalanche voltage of the diodes. This allows full amplitude control of the output, from fully-on to fully-off, without over-driving the PIN diodes.

Capacitor C3 is factory-set to prevent oscillation of the high-gain AM loop while maintaining the bandwidth necessary for optimum rise and fall-time response of the 1 kHz square wave.

Internal Leveling Mode. When the INT LEVELING switch is depressed, the dc offset through switch section S2A is disconnected and replaced by a feedback signal from detector preamplifier IC1. If the plug-in is equipped with Internal Leveling Option M2, the negative output signal of directional detector DC1 is coupled through switches S1 and S3 to the differential inputs of IC1. Assuming a perfect directional coupler and detector could be used as DC1, the feedback signal would be an exact replica of the detected output signal at J6. Amplified by IC1 and IC2, and converted to current drive by Q13, Q14, or Q15, the equal-and-opposite feedback signal will correct the output signal to a flat swept-response line, equal in amplitude at all frequencies.

External Leveling Mode. When the EXT LEVELING switch is depressed, the feedback signal from an external negative-output crystal detector is coupled through connector J5 and switches S1/S3 to amplifier IC1. The output of IC1 drives IC2 in the same manner as if an internal directional detector were used. Variable resistor R4 acts as a load for the crystal detector; it is set by the user for optimum square law response of the detector or to match the output level of the detector to the -10 millivolts per milliwatt sensitivity of the AM circuits.

Power Meter Leveling. RF plug-in units ordered with Option M7, power meter leveling, include printed circuit assembly A5 and a modified POWER control. When switch S200 is activated for power meter leveling, relays K1, K2, and K3 on A5 are activated. The input from J5 is conditioned to accept a 0 to + or -1 volt input signal from an external power meter. Resistors A5R1 and R4/R3 form a voltage divider to reduce the input amplitude from the RF power meter to levels compatible with the AM circuits. The leveling input is routed through polarity-reversing switch A5S1; when this switch is set to its M7 position, negative power meter output signals are coupled through A1S1 and A1S3 to preamplifier A1IC1. When positive input signals are used, switch A5S1 is set to its M7A position and reverses the input lines to differential amplifier A1IC1.

The contacts of relay A5K3 are closed to place an additional R-C time constant across AM driver A1IC2. This network, comprising resistor A5R2 and capacitor A5C1, reduces the bandwidth and response time of the AM loop to match its characteristics to the output characteristics of most RF power meters.

Slope Compensation. The frequency reference input from the mainframe, normally 0 to -10 volts, is inverted, offset, and increased slightly in amplitude by slope amplifier IC20. A portion of the 0 to +12 volt tuning signal selected with SLOPE control R6 provides an additional input to POWER control R5: when the SLOPE adjustment is set to ground, fully counter-clockwise, no slope compensation is added to the AM summing junction of IC2. As the control is rotated clockwise, more of the output of IC20 is allowed to be summed in as a power-increasing input. When R6 is completely clockwise and the input tuning ramp from the mainframe is at its maximum amplitude of -10 volts, a power increase of at least 3 dB is achieved in the RF output.

Unleveled Detector. Operational amplifier IC3 is configured as a comparator; when the voltage at the summing junction of IC2 is not very close to zero volt, an unleveled condition exists in the output; under normal conditions of leveling, the closed-loop AM circuit should be balanced. When the voltage at IC2 deviates from zero, the output of IC3 goes high to drive transistor Q4 on and illuminates light-emitting diode (LED) CR2.

The comparison circuit to ground is opened when OFF LEVELING switch section S2B is depressed. The LED is illuminated at all times in off leveling mode regardless of the voltage at the AM summing junction.

Modulator Bias. Operational amplifier IC17, connected as a variable voltage source, provides a bias voltage for the PIN diodes in modulator/bandswitch S2. The bias voltage is set to eliminate a "step" as the operating curves of the shunt and series PIN diodes intersect.

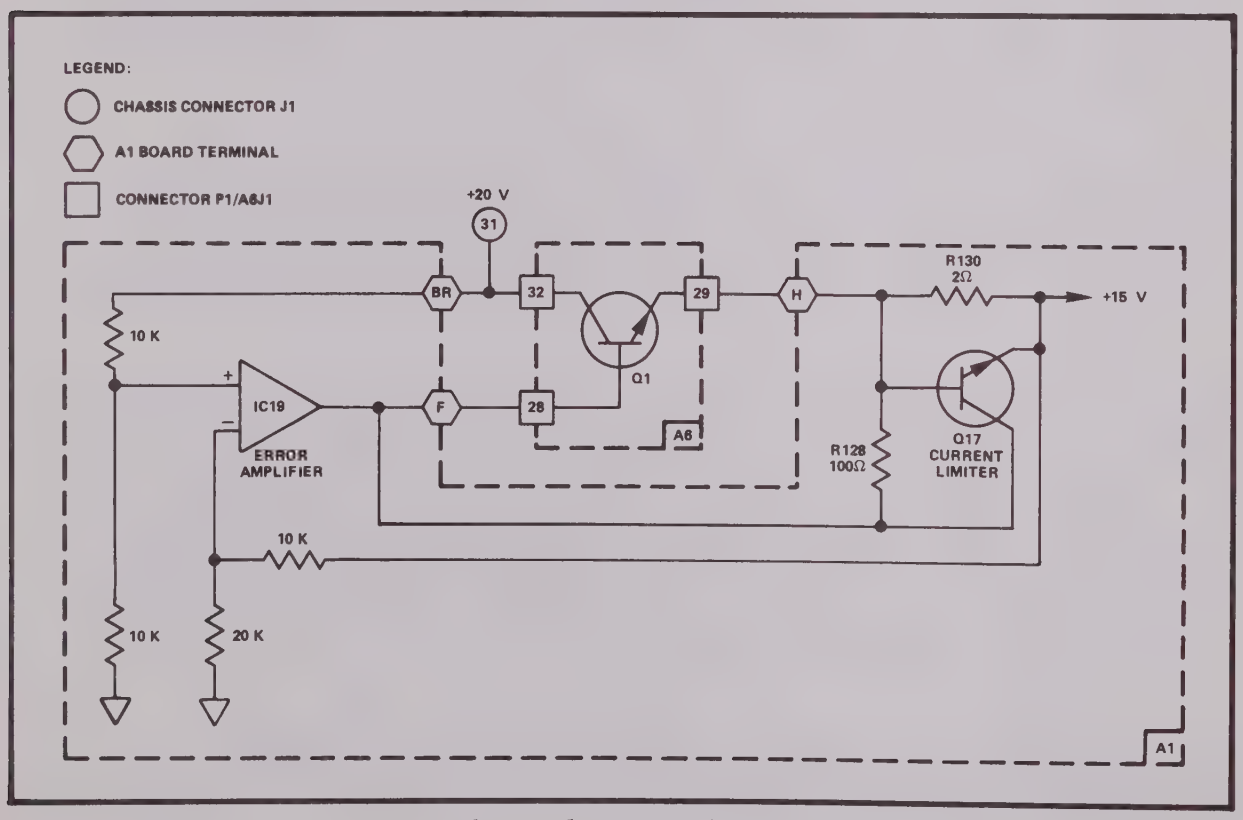


Figure 4-8. +15 Volt Regulator Simplified Schematic Diagram

4-2.7 Power Supplies (Figures 4-8 and 4-9)

Current requirements of the plug-in for +15 volt and -15 volt power exceed the 50 milliamperes available from the mainframe. A pair of on-board regulators powered by the high-current + and -20 volt power supplies provides + and -15 volt operating power for the plug-in.

4-2.7.1 +15 VOLT SUPPLY. Error amplifier A1IC19 develops base drive for pass transistor A6Q1 to maintain the +15 volt output; the resistance values of the two voltage dividers shown in the diagram are such that both inputs to IC19 will be +10 volts when the regulator is operating properly.

Resistor R130 and transistor A1Q17 limit the current capacity of the supply to a maximum of 300 milliamperes; at this current, the voltage drop across 2 Ω resistor R130 will be 600 millivolts. This 600 millivolts across the base-emitter junction of Q7 turns the transistor on, causing pass transistor A6Q1 to be turned off because its base and emitter voltages will be nearly equal.

4-2.7.2 -15 VOLT SUPPLY. Operation of the -15 volt supply is similar to that of the +15 volt supply, except Zener diode CR11 is used as a level shifter between the output of error amplifier IC18 and the base of pass transistor A6Q2.

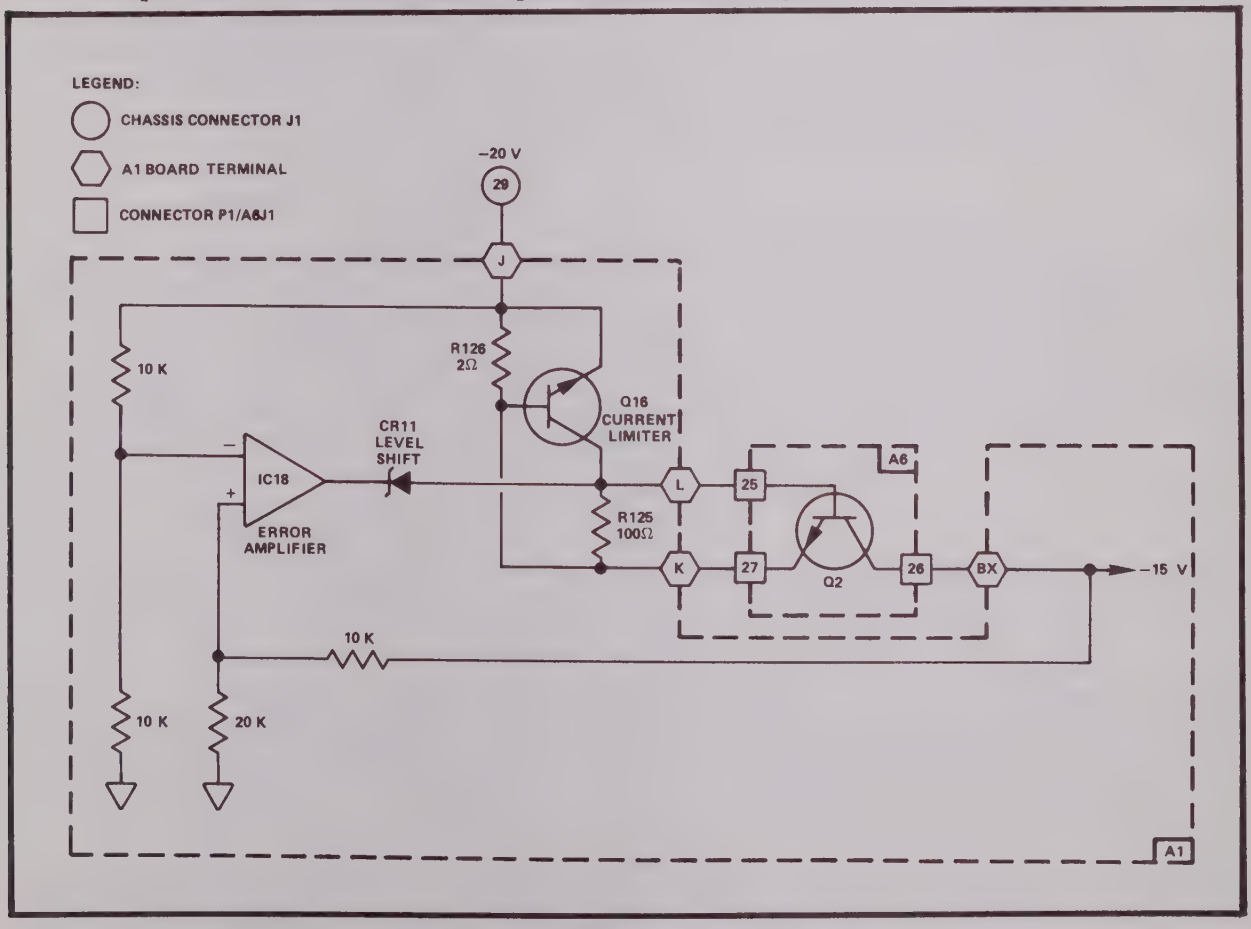


Figure 4-9. -15 Volt Regulator Simplified Schematic Diagram

SECTION V

PERFORMANCE CHECKS AND CALIBRATION

5-1. GENERAL

This section contains procedures for testing the electrical performance of the 572A-17 RF Plug-in and calibrating the unit when necessary.

Calibration accuracy checks should be undertaken only by qualified personnel with sufficient experience and knowledge to ensure that proper test methods are employed. Use standard maintenance and metrology practices when working on the plug-in.

5-2. PERFORMANCE CHECKS

This paragraph contains the performance check procedures listed in Table 5-1. These performance checks verify that the instrument meets the applicable performance specifications in Table 1-1. Failure to meet the specified performance limits indicates the need for repair or recalibration in accordance with the procedure of Paragraph 5-3.

The following performance checks may be made at any time, and should be performed annually in the order indicated. If these checks reveal the need for repair or recalibration of the instrument, it should be returned to Systron-Donner or another qualified metrology laboratory so that the calibration procedure in Paragraph 5-3 may be accomplished.

5-2.1 Equipment Required

The test equipment required to check performance of the plug-in is listed in Table 5-2. All test equipment should bear evidence of recent calibration by a qualified metrology laboratory. Equipment equivalent to that listed in Table 5-2 may be used, but care should be taken to ensure that the rated accuracy of the equipment used is truly equivalent to that cited. In any case, the maximum rated inaccuracy of a piece of test equipment used to measure any parameter must be no greater than one-tenth the maximum inaccuracy which can be tolerated in the measurement.

5-2.2 Alternate Test Equipment

In many cases, the recommended test equipment will not be available but alternate test equipment can be constructed from standard coaxial components and instruments.

5-2.2.1 POWER METER. The Systron-Donner Model 4021 is listed because it combines the features of an RF power meter and a logarithmic converter; in measurements requiring readout in logarithmic terms (decibel measurements) the 4021 will read directly in terms of the measurements. The output of the 4021. when fed to a general-purpose linear oscilloscope, allows measurement in terms of 1.0 or 10.0 dB per linear graticule division.

If such a power meter is not available, any high-quality power meter with a dynamic range of 50 dB may be used for power measurements. Some acceptable instruments are Hewlett-Packard Model 432A or 435, PRD 686, Boonton 42, etc. (all with appropriate temperature-compensated thermistor mounts rated to 18 GHz).

Table 5-1. Performance Checks

PARAGRAPH NUMBER	PROCEDURE	SPECIFICATION REFERENCE ITEM (TABLE 1-1)
5-2.4	Frequency Accuracy	2
5-2.5	Power Output and Internal Leveling Flatness	4, 5
5-2.6	Unleveled Power Output and Flatness	4, 5
5-2.7	Residual Amplitude Modulation	8
5-2.8	Residual Frequency Modulation	7
5-2.9	Spurious and Harmonic Content	6

Table 5-2. Test Equipment Required for Performance Checks

ITEM	TYPE OF EQUIPMENT	CHARACTERISTICS	RECOMMENDED MODEL*
1	Sweeper Mainframe	572A-17-compatible	Systron Donner 540B
2	Frequency Counter	2 to 18 GHz	Systron Donner 6054B
3	Spectrum Analyzer	2 to 40 GHz; 10 kHz/ division resolution, 30 kHz IF bandwidth	Systron Donner 4809B with 2311, 4701, and external mixers
4	Oscilloscope	High sensitivity with variable bandwidth	Tektronix 544/1A7A or 5000-series mainframe with time base and 5A22
5	RF Power Meter	2 to 18 GHz	Systron Donner 4021
6	Directional Detector	2 to 18 GHz	Systron Donner 1021
7	Crystal Detector	2 to 18 GHz; APC-7 connector	Krytar D100; Hewlett Packard 8470B
8	RF Attenuator	10 dB, 2 to 18 GHz; APC-7 connector	Systron Donner 447-10
9	RF Cable	50Ω; APC-7 connector one end, Type N other end	As required
10	RF Cable	50Ω; BNC to BNC	As required

*Equipment having equivalent characteristics may be substituted

5-2.2.2 DIRECTIONAL DETECTOR. If the specified directional detector is not available, separate directional couplers covering the individual frequency bands of the RF plug-in may be used. The coupling factor of the unit must be 10 to 13 dB, and the coupled output must be fitted with a crystal detector rated for the same frequency range. The combined flatness error of the directional coupler(s) and crystal detector should not exceed ± 0.5 dB over the frequency range.

5-2.3 Initial Setup

5-2.3.1 DESCRIPTION. Various controls are preset to desired position to facilitate subsequent measurements. Connect the equipment and set controls as described below. Do not apply power at this time.

5-2.3.2 PROCEDURE.

1. Install the RF plug-in and dial drum in accordance with the instructions in Section II; be sure to turn the locking knob at least five turns CCW before inserting the plug-in. Turn the locking knob CW to secure the plug-in.
2. Set the mainframe F1 - START control to its maximum CCW position.
3. Set the mainframe F2 - STOP control to its maximum CW position.
4. Depress and latch the CW MODULATION MODE pushbutton.
5. Depress and latch the CW SWEEP MODE pushbutton.
6. Set the mainframe INTENSITY MARKER ON/OFF switch to OFF.
7. Depress and latch the plug-in front-panel LEVELING OFF pushbutton.
8. Set the plug-in POWER control to its maximum CW position.
9. Using the Type APC-7 to N RF cable and a 10 dB attenuator, connect the RF output of the plug-in to the input of the frequency counter.

CAUTION

DAMAGE TO THE COUNTER MAY RESULT IF THE ATTENUATOR IS NOT USED.

10. Turn on the mainframe power switch, then allow the units to warm up for 5 to 10 minutes.

5-2.4 Frequency Accuracy

5-2.4.1 DESCRIPTION. The RF output frequency is measured to ensure that the indicated and actual output frequencies are coincident within the specified tolerance.

NOTE

In order to obtain meaningful results, the dial accuracy of the mainframe must have been checked, and calibrated if necessary, immediately before beginning this procedure.

5-2.4.2 PROCEDURE. Frequency accuracy should be checked at an ambient air temperature of +25°C (+77°F). When setting the frequency, take care to view the indicators straight on to eliminate parallax:

1. Set the BAND SELECT switch to Band 1.
2. Carefully set the F1 - START control so that the indicator is aligned with the first major dial mark.
3. The frequency counter must show the indicated frequency ±20 MHz.
4. Repeat the test for as many dial marks as you wish to test (testing every 1,000 MHz is usually sufficient). The frequency tolerance must not exceed ±1% of the indicated frequency at any point.
5. Set the BAND SELECT switch to Band 2.
6. Test as many dial settings as desired for frequency accuracy. A maximum error of ±1% is permissible (± 80 MHz at 8 GHz, ±124 MHz at 12.4 GHz).
7. Set the BAND SELECT switch to Band 3.
8. Check the frequency accuracy; a maximum error of ±1% is permissible.
9. Set the BAND SELECT switch to Band 4.
10. Check the frequency accuracy; a maximum error of ±2% is permissible (±40 MHz at 2 GHz, ±360 MHz at 18 GHz).

5-2.5 Power Output and Internal Leveling Flatness

5-2.5.1 DESCRIPTION. The minimum output power over the range of the plug-in is measured in leveled output mode. This procedure is used only with units equipped with Internal Leveling Option M2. The rear-panel label will indicate if the plug-in is equipped with Option M2; also, such units have a gold-colored RF OUT connector. Units without Option M2 have a silver-colored RF OUT connector.

Go directly to Paragraph 5-2.6 for the procedure used to test standard (non-M2) 572A-17 RF plug-ins.

5-2.5.2 PROCEDURE.

1. Set the BAND SELECT switch to Band 1.
2. Depress and latch the INT LEVELING pushbutton.

3. Depress and latch the MANUAL SWEEP (540B) or MANUAL SCAN (540) pushbutton.

4. Set the SWEEP CONTROL (540B) or VERNIER/MANUAL SCAN control (540) to its maximum CCW position.

5. Set the F1-START control so the frequency counter reads 2000 ± 10 MHz.

6. Rotate the SWEEP CONTROL (540B) or VERNIER/MANUAL SCAN control (540) to maximum CW.

7. Set the F2-STOP control so the counter reads 8000 ± 40 Mhz.

8. Return the SWEEP CONTROL (540B) or VERNIER/MANUAL SCAN control (540) to maximum CCW and check the frequency reading; reset the F1 - START control if necessary.

9. Press and latch the MODULATION MODE RF OFF pushbutton.

10. Remove the counter input cable from the plug-in RF OUT connector; connect the thermistor mount or power head of the power meter.

IMPORTANT

The 10 dB attenuator must remain attached to the plug-in RF OUT connector to reduce mismatch losses which might affect measurement accuracy and to avoid possible power meter damage.

11. Set the power meter to its 10 mW (+10 dBm) range (not necessary if Systron-Donner Model 4021 is used).

12. Depress and latch the MODULATION MODE CW pushbutton.

13. While manually scanning the band, reduce the POWER control setting until the UNLEVELED indicator is illuminated at only one or two points across the band.

14. Reduce the power output of the plug-in to the point where the UNLEVELED indicator just goes out at the last unleveled point in the band.

15. Set the power meter range switch to the position which allows the best resolution.

16. Check the power meter reading while manually scanning the entire band; the minimum power must not be less than 5 mW (+7 dBm). Because a 10 dB attenuator was used, the power meter reading will be ≥ 500 μW (-3 dBm).

17. Vary the SWEEP CONTROL (540B) or MANUAL SCAN control (540) over its full range again; check the power meter reading to ensure that the total power level variation over the band does not exceed 2.0 dB. This verifies the leveled flatness specification of ≤ ± 1 dB.

18. Set the BAND SELECT switch to Band 2.

19. Press the RF OFF pushbutton and reconnect the RF output of the plug-in (through the 10 dB attenuator) to the frequency counter.

20. Press the CW pushbutton; advance the POWER control fully CW.

21. Set the band limits to manually scan 8,000 ±40 MHz to 12,400 ± 62 MHz.

22. Press and latch the MODULATION MODE RF OFF pushbutton.

23. Remove the counter input cable from the plug-in RF OUT connector; connect the thermistor mount or power head of the power meter.

IMPORTANT

The 10 dB attenuator must remain in the line.

24. Set the power meter to its highest power range (not necessary if Systron-Donner Model 4021 is used).

25. Depress and latch the MODULATION MODE CW pushbutton.

26. While manually scanning the band, slowly reduce the POWER control setting until the UNLEVELED indicator is illuminated at only one or two points across the band.

27. Reduce the power output of the plug-in to the point where the UNLEVELED indicator just goes out at the last unleveled point in the band.

28. Set the power meter range switch to the position which allows the best resolution.

29. Check the power meter reading while manually scanning the entire band; the minimum power must not be less than 5 mW (+7 dBm). Because a 10 dB attenuator was used, the power meter reading will be ≥ 500 μW (-3 dBm).

30. Vary the SWEEP CONTROL (540B) or MANUAL SCAN control (540) over its full range again; check the power meter reading to ensure that the total power level variation over the band does not exceed 2.0 dB. This verifies the flatness specification of ±1 dB.

31. Set the BAND SELECT switch to Band 3.

32. Press the RF OFF pushbutton and reconnect the RF output of the plug-in (through the 10 dB attenuator) to the frequency counter.

33. Press the CW pushbutton; advance the POWER control fully CW.

34. Set the band limits to manually scan 12,400 ± 62 MHz to 18,000 ± 90 MHz.

35. Press and latch the MODULATION MODE RF OFF pushbutton.

36. Remove the counter input cable from the plug-in RF OUT connector; connect the thermistor mount or power head of the power meter.

IMPORTANT

The 10 dB attenuator must remain in the line.

37. Set the power meter to its 10 mW (+10 dBm) range (not necessary if Systron-Donner Model 4021 is used).

38. Depress and latch the MODULATION MODE CW pushbutton.

39. While manually scanning the band, slowly reduce the POWER control setting until the UNLEVELED indicator is illuminated at only one or two points across the band.

40. Reduce the power output of the plug-in to the point where the UNLEVELED indicator just goes out at the last unleveled point in the band.

41. Set the power meter range switch to the position which allows the best resolution.

42. Check the power meter reading while manually scanning the entire band; the minimum power must not be less than 5mW (+7 dBm). Because a 10 dB attenuator was used, the power meter reading will be $\geq 500\mu$W (-3 dBm).

43. Vary the SWEEP CONTROL (540B) or MANUAL SCAN control (540) over its full range again; check the power meter reading to ensure that the total power level variation over the band does not exceed 2.0 dB. This verifies the leveled flatness specification of $\leq \pm 1$ dB.

44. With the MANUAL SCAN control set to its maximum CW position, slowly increase the maximum frequency limit by rotating the F2 - STOP control CW.

45. Watch the power meter, and cease increasing the frequency limit when the power meter reading drops to 3 mW (+2 dBm). If the power meter reading does not drop to this level, it is unnecessary to perform steps 46 and 47.

46. Transfer the output cable and attenuator to the frequency counter.

47. Determine that the 3 mW power point is $\geq$ 18,500 MHz. The output power from 18 to 18.5 GHz is not a specified parameter, but a normally-operating unit will have $\geq$ 3 mW output at 18.5 GHz.

48. Set the BAND SELECT switch to Band 4.

49. Set the manual scan sweep limits to 2000 $\pm$10 MHz at the low-frequency end and 18,000 $\pm$ 90 MHz at the high-frequency end.

51. Remove the counter input cable from the plug-in RF OUT connector; connect the thermistor mount or power head of the power meter.

IMPORTANT

The 10 dB attenuator must remain in the line.

52. Set the power meter to its 10 mW (+ 10 dBm) range (not necessary if Systron-Donner Model 4021 is used).

53. Depress and latch the MODULATION MODE CW pushbutton.

54. While manually scanning the band, slowly reduce the POWER control setting until the UNLEVELED indicator is illuminated at only one or two points across the band.

55. Reduce the power output of the plug-in to the point where the UNLEVELED indicator just goes out at the last unleveled point in the band.

56. Set the power meter range switch to the position which allows the best resolution.

57. Check the power meter reading while manually scanning the entire band; the minimum power must not be less than 5 mW (+7 dBm). Because a 10 dB attenuator was used, the power meter reading will be $\geq 500\ \mu W$ (-3 dBm).

58. Vary the SWEEP CONTROL (540B) or MANUAL SCAN control (540) over its full range again; check the power meter reading to ensure that the total power level variation over the band does not exceed 2.0 dB. This verifies the flatness specification of $\leq \pm 1$ dB.

5-2.6 Unleveled Power Output and Flatness

5-2.6.1 DESCRIPTION. The peak output power amplitude is measured over the full frequency range of the plug-in to ensure conformance with minimum output power and flatness specifications. This procedure is used for all Model 572A-17 plug-ins, including those equipped with Internal Leveling Option M2.

5-2.6.2 PROCEDURE.

1. Set the Band Select switch to Band 1.

2. Depress and latch the LEVELING OFF switch.

3. Depress and latch the MANUAL SWEEP (540B) or MANUAL SCAN (540) pushbutton.

4. Set the SWEEP CONTROL (540B) or VERNIER/MANUAL SCAN control (540) to its maximum CCW position.

5. Set the F1 - START control so that the frequency counter reads 2000 ± 10 MHz.

6. Rotate the SWEEP CONTROL (540B) or VERNIER/MANUAL SCAN control (540) to maximum CW.

7. Set the F2-STOP control so the counter reads 8000 ± 40 MHz.

8. Return the SWEEP CONTROL (540B) or VERNIER/MANUAL SCAN control (540) to maximum CCW and check the frequency reading; reset the F1-START control if necessary.

9. Press and latch the MODULATION MODE RF OFF pushbutton.

10. Remove the counter input cable from the plug-in RF OUT connector; connect the thermistor mount or power head of the power meter.

IMPORTANT

The 10 dB attenuator must remain attached to the plug-in RF OUT connector to reduce mismatch losses which might affect measurement accuracy and to avoid possible power meter damage.

11. Set the power meter to its 10 mW (+ 10 dBm) range (not necessary if Systron-Donner Model 4021 is used).

12. Depress and latch the MODULATION MODE CW pushbutton.

13. Set the POWER control to its maximum CW position; leave it at this position for the rest of this procedure.

14. Slowly vary the MANUAL SCAN control over its full range.

15. Set the power meter range switch to the position which allows the best resolution.

16. Check the power meter reading while manually scanning the entire band; note the maximum and minimum amplitude.

17. Verify that the minimum power is ≥ 6.31 mW (+ 8 dBm). Because a 10 dB attenuator was used, the power meter reading will be ≥ 631 μW (-2 dBm).

18. Verify that the maximum power variation (P_{max}-P_{min}) does not exceed 6 dB.

19. Set the BAND SELECT switch to Band 2.

20. Press the RF OFF pushbutton and reconnect the RF output of the plug-in (through the 10 dB attenuator) to the frequency counter.

21. Press the MODULATION MODE CW pushbutton.

22. Set the band limits to manually scan 8000 ± 40 MHz to 12,400 ± 62 MHz.

23. Press and latch the MODULATION MODE RF OFF pushbutton.

24. Remove the counter input cable from the plug-in RF OUT connector; connect the thermistor mount or power head of the power meter.

IMPORTANT

The 10 dB attenuator must remain in the line.

25. Set the power meter to its highest power range (not necessary if Systron-Donner Model 4021 is used).

26. Depress and latch the MODULATION MODE CW pushbutton.

27. Vary the SWEEP CONTROL or MANUAL SCAN control over its range.

28. Set the power meter range switch for best resolution.

29. Check the power meter reading while manually scanning the entire band; note the maximum and minimum amplitudes.

30. Verify that the minimum power is ≥10 mW (+10 dBm). Because a 10 dB attenuator was used, the power meter reading will be ≥1.0 mW (0 dBm).

31. Verify that the maximum power variation is ≤6 dB.

32. Set the BAND SELECT switch to Band 3.

33. Press the RF OFF pushbutton and reconnect the RF output of the plug-in (through the 10 dB attenuator) to the frequency counter.

34. Press the MODULATION MODE CW pushbutton.

35. Set the band limits to manually scan 12,400 ±62 MHz to 18,000 ± 90 MHz.

36. Press and latch the MODULATION MODE RF OFF switch.

37. Remove the counter input cable from the plug-in RF OUT connector; connect the thermistor mount or power head of the power meter.

IMPORTANT

The 10 dB attenuator must remain in the line.

38. Set the power meter to its highest power range (not necessary if Systron-Donner Model 4021 is used).

39. Depress and latch the MODULATION MODE CW switch.

40. Slowly vary the MANUAL SCAN control over its full range.

41. Set the power meter range switch for best resolution.

42. Check the power meter reading while manually scanning the entire band; note the maximum and minimum amplitudes.

43. Verify that the minimum power is ≥10 mW (+10 dBm). Because a 10 dB attenuator was used, the power meter reading will be ≥1.0 mW (0 dBm).

44. Verify that the maximum power variation is ≤6 dB.

45. Set the BAND SELECT switch to Band 4.

46. Press the RF OFF pushbutton and reconnect the RF output of the plug-in (through the 10 dB attenuator) to the frequency counter.

47. Press the MODULATION MODE CW pushbutton.

48. Set the band limits to manually scan 2000 ± 10 to 18,000 ± 90 MHz.

49. Press and latch the MODULATION MODE RF OFF switch.

50. Remove the input connector from the counter and connect it to the thermistor mount or power head of the power meter.

IMPORTANT

The 10 dB attenuator must remain in the line.

51. Set the power meter to its highest power range (not necessary if Systron-Donner Model 4021 is used).

52. Depress and latch the MODULATION MODE CW switch.

53. Slowly vary the SWEEP CONTROL or MANUAL SCAN control over its full range.

54. Set power meter range switch to the position which allows the best resolution.

55. Check the power meter reading while manually scanning the entire band; note the maximum and minimum amplitudes.

56. Verify that the minimum power is ≥6.31 mW (+8 dBm). Because a 10 dB attenuator was used, the power meter reading will be ≥631 μW (-2 dBm).

57. Verify that the maximum power variation ($P_{max} - P_{min}$) does not exceed 12 dB.

5-2.7 Residual Amplitude Modulation

5-2.7.1 DESCRIPTION. The content of unwanted amplitude modulation of the RF output signal is measured to ensure that it is not in excess of the specified value.

5-2.7.2 PROCEDURE.

1. Set the BAND SELECT switch to Band 1.

2. Depress and latch the SWEEP MODE F1 - F2 switch.

3. Set the F1 - START control so the F1 - START frequency indicator is about 3/8 of the way between the lowest and highest marked frequencies.

4. Set the F2 - STOP control so the F2 - STOP frequency indicator is about 5/8 of the way between the lowest and highest frequency marks (residual AM is generally highest at mid-band; performance will be checked under worst-case conditions).

5. Depress and latch the MODULATION MODE CW pushbutton.

6. Set the RETRACE pushbutton for off (out).

7. Depress and latch the SWEEP SPEED FAST (540) or FAST SWEEP (540B) pushbutton.

8. Depress and latch the INT TRIGGER pushbutton.

9. Attach a 10 dB attenuator to the RF OUT connector.

10. Attach a crystal detector to the output of the 10 dB attenuator.

11. Connect the output of the crystal detector to the vertical input of the oscilloscope plug-in.

12. Set the oscilloscope bandwidth controls for a lower limit of dc and an upper limit of 100 kHz.

13. Set the oscilloscope time-base controls for an internally-generated free-running trace; use any convenient sweep rate.

14. Set the oscilloscope coupling to ground and carefully zero the trace.

15. Depress and latch the LEVELING OFF pushbutton.

16. Turn the POWER control fully CW.

17. Set the vertical sensitivity of the oscilloscope to 5 mV/division (this may be changed later to obtain the most accurate reading).

18. Set the oscilloscope coupling switch to "dc".

19. Measure and note the dc amplitude of the detected RF output; use the sweep retrace line as zero and the peak level of the unsynchronized trace as V_o (output voltage). Resolve as closely as possible.

20. Set the oscilloscope coupling switch to "ac".

21. Depress and latch the RETRACE pushbutton.

22. Measure the p-p voltage of the detected waveform.

23. Divide the amplitude V_o noted in step 19 by 200; verify that the signal level measured in step 22 is less than this figure ($V_o \div 200 = 46$ dB).

24. Depress and latch the INT LEVELING pushbutton. If the 572A-17 plug-in is not equipped with Option M2 (internal leveling), use an external directional detector designed to operate over the 2 to 8 GHz range and depress the EXT LEVELING pushbutton.

25. Remove the crystal detector from the output of the 10 dB attenuator.

26. Connect a power meter to the output of the attenuator.

27. Adjust the POWER control for a power meter reading of 631 μW (-2 dBm). This sets the output level of the plug-in to the rated leveled output amplitude in Band 1, taking the 10 dB attenuator into account.

28. Without changing the setting of the POWER control, disconnect the power meter from the output of the 10 dB attenuator and reconnect the crystal.

29. Set the oscilloscope coupling switch to "dc".

30. Depress and release the RETRACE pushbutton.

31. Measure and note the dc amplitude of the detected RF output from sweep retrace (zero) to peak (V_o).

32. Set the oscilloscope coupling switch to "ac".

33. Depress and latch the RETRACE pushbutton.

34. Measure the p-p value of the detected waveform.

35. Verify that the leveled mode residual AM index is at least 40 dB by dividing the amplitude V_o (step 31) by 100 ($V_o \div 100 = 40$ dB).

36. Set the BAND SELECT switch to Band 2.

37. Depress and latch the LEVELING OFF pushbutton.

38. Turn the POWER control fully CW.

39. Depress and release the RETRACE pushbutton.

40. Set the oscilloscope coupling switch to "dc".

41. Measure and note the dc amplitude of the detected RF output; use the sweep retrace line as zero and the peak level of the unsynchronized trace as V_o (output voltage). Resolve as closely as possible.

42. Set the oscilloscope coupling switch to "ac".

43. Depress and latch the RETRACE switch.

44. Measure the p-p voltage of the detected waveform.

45. Divide the amplitude V_o noted in step 41 by 200; verify that the signal level measured in step 44 is less than this figure ($V_o \div 200 = 46$ dB).

46. Depress and latch the INT LEVELING pushbutton, or depress the EXT LEVELING pushbutton and install directional detector rated for operation from 8 to 12.4 GHz.

47. Remove the crystal detector from the output of the 10 dB attenuator.

48. Connect a power meter to the output of the attenuator.

49. Adjust the POWER control for a power meter reading of 1.0 mW (0 dBm). This sets the output level of the plug-in to the rated leveled output amplitude in Band 2, taking the 10 dB attenuator into account.

50. Without changing the setting of the POWER control, disconnect the power meter from the output of the 10 dB attenuator and reconnect the crystal.

51. Set the oscilloscope coupling switch to "dc".

52. Depress and release the RETRACE pushbutton.

53. Measure and note the dc amplitude of the detected RF output from sweep retrace (zero) to peak (V_o).

54. Set the oscilloscope coupling switch to "ac".

55. Depress and latch the RETRACE pushbutton.

56. Measure the p-p value of the detected waveform.

57. Verify that the leveled mode residual AM index is at least 40 dB by dividing the amplitude V_o (step 53) by 100 ($V_o \div 100 = 40$ dB).

58. Set the BAND SELECT switch to Band 3.

59. Depress and latch the LEVELING OFF pushbutton.

60. Turn the POWER control fully CW.

61. Depress and release the RETRACE pushbutton.

62. Set the oscilloscope coupling switch to "dc".

63. Measure and note the dc amplitude of the detected RF output; use the sweep retrace line as zero and the peak level of the unsynchronized trace as V_o (output voltage). Resolve as closely as possible.

64. Set the oscilloscope coupling switch to "ac."

65. Depress and latch the RETRACE switch.

66. Measure the p-p voltage of the detected waveform.

67. Divide the amplitude V_o noted in step 63 by 200; verify that the signal level measured in step 66 is less than this figure ($V_o \div 200 = 46$ dB).

68. Depress and latch the INT LEVELING pushbutton; if the plug-in is not equipped with Option M2, depress the EXT LEVELING pushbutton and install a suitable 12.4 to18 GHz directional detector.

69. Remove the crystal detector from the output of the 10 dB attenuator.

70. Connect a power meter to the output of the attenuator.

71. Adjust the POWER control for a power meter reading of 1.0 mW (0 dBm). This sets the output level of the plug-in to the rated level output amplitude in Band 3, taking the 10 dB attenuator into account.

72. Without changing the setting of the POWER control, disconnect the power meter from the output of the 10 dB attenuator and reconnect the crystal.

73. Set the oscilloscope coupling switch to "dc."

74. Depress and release the RETRACE pushbutton.

75. Measure and note the dc amplitude of the detected RF output from sweep retrace (zero) to peak (V_o).

76. Set the oscilloscope coupling switch to "ac."

77. Depress and latch the RETRACE pushbutton.

78. Measure the p-p value of the detected waveform.

79. Verify that the leveled mode residual AM index is at least 40 dB by dividing the amplitude V_o (step 75) by 100 ($V_o \div 100 = 40$ dB).

5-2.8 Residual Frequency Modulation

5-2.8.1 DESCRIPTION. The content of unwanted frequency changes in the continuous wave (CW) RF output signal is measured to ensure that it is below the allowable maximum.

5-2.8.2 PROCEDURE.

1. Set the BAND SELECT switch to Band 1.

2. Depress and latch the CW SWEEP MODE pushbutton.

3. Set the CW controls so the CW frequency indicator is at mid-band.

4. Depress and latch the SLOW SWEEP SPEED pushbutton.

5. Press the EXT/MAN TRIGGER pushbutton.

6. Press and latch the RETRACE pushbutton.

7. Depress and latch the INT LEVELING pushbutton. If the 572A-17 plug-in is not equipped with Internal Leveling Option M2, install a suitable 2 to 18 GHz external directional detector and depress the EXT LEVELING pushbutton.

8. Attach a 10 dB attenuator to the RF OUT connector.

9. Set the spectrum analyzer input attenuator to 20 dB; this may be changed later.

10. Connect a power meter to the output of the attenuator.

11. Adjust the POWER control for a power meter reading of 500 μW (-3dBm). This sets the output level of the plug-in to the rated leveled output amplitude, taking the 10 dB attenuator into account.

12. Without changing the setting of the POWER control, disconnect the power meter from the output attenuator.

13. Connect a cable between the output of the attenuator and the spectrum analyzer RF input.

14. Tune the spectrum analyzer to the output frequency of the plug-in; adjust the RF and IF attenuators for a display of the carrier aligned with the logarithmic reference line of the analyzer display.

IMPORTANT

Be sure the input signal amplitude is not excessive. Spurious products generated within the spectrum analyzer by excessive input levels will compromise measurement accuracy.

15. Adjust the spectrum analyzer controls to phase-lock the analyzer to the input signal.

16. Adjust the spectrum analyzer dispersion control(s) for 10 kHz/division.

17. Adjust the spectrum analyzer bandwidth control(s) to 30 kHz.

18. Set the sweep speed control(s) for a slow sweep, about 1 second/division.

19. As the spectrum analyzer CRT trace reaches the log reference level, measure the number of horizontal divisions covered by the trace at the logarithmic reference level. Measure several cycles.

20. Multiply the number of divisions covered by the trace at the peak level

by the dispersion figure. Verify that the residual FM content is less than 35 kHz.

21. Set the BAND SELECT switch to Band 2.

22. Disconnect the spectrum analyzer input cable from the attenuator output.

23. Repeat steps 10 through 20.

24. Set the BAND SELECT switch to Band 3.

25. Disconnect the spectrum analyzer input cable from the attenuator output.

26. Repeat steps 10 through 20.

27. Set the BAND SELECT switch to Band 4.

28. Disconnect the spectrum analyzer input cable from the output of the attenuator.

29. Repeat steps 10 through 19.

30. Multiply the number of divisions covered by the trace at the peak level by the dispersion figure. Verify that the residual FM content is less than 40 kHz.

5-2.9 Spurious and Harmonic Content

5-2.9.1 DESCRIPTION. The content of unwanted spurious and harmonic outputs in the RF signal is measured to ensure conformance with the specified maxima.

5-2.9.2 PROCEDURE. Parts of this procedure may have to be deleted if specialized test equipment is not available. The spectrum analyzer cited in Table 5-1, used in conjunction with its available external mixers, covers the 10 MHz to 40 GHz frequency range. This is sufficient to allow viewing of the third harmonic of 12.4GHz or the second harmonic of 18 GHz.

The spectrum analyzer and external mixers must be calibrated and used in accordance with the manufacturer's instructions to assure amplitude calibration between the fundamental and harmonic frequencies.

1. Set the BAND SELECT switch to Band 1.

2. Depress and latch the SWEEP MODE CW pushbutton.

3. Set the CW control so the CW frequency indicator is at mid-band.

4. Depress and latch the SLOW SWEEP SPEED pushbutton.

5. Press the EXT/MAN TRIGGER pushbutton.

6. Press and latch the RETRACE pushbutton.

7. Depress and latch the INT LEVELING pushbutton. If the 572A-17 plug-in is not equipped with Internal Leveling Option M2, install a suitable 2 to 18 GHz external directional detector and depress the EXT LEVELING pushbutton.

8. Attach a 10 dB attenuator to the RF OUT connector.

9. Set the spectrum analyzer input attenuator to 20 dB; this may be changed later.

10. Connect a power meter to the output of the attenuator.

11. Adjust the POWER control for a power meter reading of 500 μW (-3dBm). This sets the output level of the plug-in to the rated leveled output amplitude, taking the 10 dB attenuator into account.

12. Without changing the setting of the POWER control, disconnect the power meter from the output attenuator.

13. Connect a cable between the output of the attenuator and the spectrum analyzer RF input.

14. Tune the spectrum analyzer to the output frequency of the plug-in (about 5 GHz); adjust the RF and IF attenuators for a display of the carrier aligned with the logarithmic reference line of the analyzer display.

IMPORTANT

Be sure the input signal amplitude is not excessive. Spurious products generated within the spectrum analyzer by excessive input levels will compromise measurement accuracy.

15. Adjust the spectrum analyzer dispersion control(s) for 1 MHz/division.

16. Tune the spectrum analyzer over the frequency range of 2 to 8 GHz; use the spectrum analyzer manufacturer's recommended signal identification procedures to determine that any observed signal within 60 dB of the log reference level is "real" and not a spurious response generated within the spectrum analyzer. Ignore responses within 1 MHz of the carrier frequency.

17. Verify that any spurious responses within the 2 to 8 GHz band which are not generated within the spectrum analyzer, and are not within 1 MHz of the carrier frequency, are $\geq$ 60 dB down from carrier level.

18. Set the CW control for an output frequency of 2.5 GHz.

19. If necessary, readjust the spectrum analyzer IF attenuator so that the peak level of the signal is aligned with the logarithmic reference level.

20. Measure the signal levels at 5 and 7.5 GHz; verify that the second and third harmonic outputs are $\geq$ 18 dB below the log reference level.

21. Set the CW control for an output frequency of 4 GHz; readjust the IF attenuator if necessary.

22. Verify the second and third harmonics (at 8 and 12 GHz) are ≥ 20 dB below the log reference level.

23. Set the CW control for an output frequency of 6.5 GHz and adjust the spectrum analyzer IF attenuator to set the log reference level.

24. Verify the second and third harmonics (at 13 and 19.5 GHz) are ≥ 25 dB below the log reference level.

25. Set the BAND SELECT switch to Band 2.

26. Adjust the output frequency to 10 GHz (approximately mid-band).

27. Tune the spectrum analyzer to the output frequency of the plug-in; adjust the RF and IF attenuators for a display of the carrier aligned with the log reference line of the analyzer display. Be careful not to overload the spectrum analyzer input.

28. Tune the spectrum analyzer over the frequency range of 8 to 12.4 GHz; use the spectrum analyzer manufacturer's recommended signal identification procedures to determine that any observed signal within 60 dB of the log reference level is "real" and not a spurious response generated within the spectrum analyzer. Ignore responses within 1 MHz of the carrier frequency.

29. Verify that any spurious responses within the 8 to 12.4 GHz band which are not generated within the spectrum analyzer, and are not within 1 MHz of the carrier frequency, are ≥ 60 dB down from carrier level.

30. Check the second harmonic frequency at 20 GHz and the third harmonic frequency at 30 GHz. Verify the harmonics are ≥ 25 dB below the log reference level.

31. Set the BAND SELECT switch to Band 3.

32. Set the output frequency to 15 GHz (approximately mid-band).

33. Tune the spectrum analyzer to the output frequency of the plug-in; adjust the RF and IF attenuators for a display of the carrier aligned with the log reference line of the analyzer display. Be careful not to overload the spectrum analyzer input.

34. Tune the spectrum analyzer over the frequency range of 12.4 to 18 GHz. use the spectrum analyzer manufacturer's recommended signal identification procedures to determine that any observed signal within 60 dB of the log reference level is "real" and not a spurious response generated within the spectrum analyzer. Ignore responses within 1 MHz of the carrier frequency.

35. Verify that any spurious responses within the 12.4 to 18 GHz band which

Table 5-3. Calibration Procedures

FUNCTION	CONTROL OR COMPONENT	LOCATION	REFERENCE PARAGRAPH
Band 1 Vb Adjust	R4	A2 Band 1 Oscillator Driver	5-3.5.1
Band 1 Vb Set*	CR5, R16	A2 Band 1 Oscillator Driver	6-3.5.1*
Band 1 Vb Programming*	R8	A2 Band 1 Oscillator Driver	6-3.5.1*
Band 2 Vb Adjust	R4	A3 Band 2 Oscillator Driver	5-3.5.2
Band 2 Vb Set*	CR5, R16	A3 Band 2 Oscillator Driver	6-3.5.2*
Band 2 Vb Programming*	R15	A3 Band 2 Oscillator Driver	6-3.5.2*
Band 3 Vb Adjust	R4	A4 Band 3 Oscillator Driver	5-3.5.3
Band 3 Vb Set*	CR5, R16	A4 Band 3 Oscillator Driver	6-3.5.3*
Band 3 Vb Programming*	R15	A4 Band 3 Oscillator Driver	6-3.5.3*
Band 1 Oscillator Start Frequency Adjust	R5	A2 Band 1 Oscillator Driver	5-3.5.1
Band 1 Oscillator Stop Frequency Adjust	R25	A2 Band 1 Oscillator Driver	5-3.5.1
Band 1 Oscillator Limit Frequency Adjust	R30	A2 Band 1 Oscillator Driver	5-3.5.1
Band 2 Oscillator Start Frequency Adjust	R5	A3 Band 2 Oscillator Driver	5-3.5.2
Band 2 Oscillator Stop Frequency Adjust	R25	A3 Band 2 Oscillator Driver	5-3.5.2
Band 2 Oscillator Limit Frequency Adjust	R30	A3 Band 2 Oscillator Driver	5-3.5.2
Band 3 Oscillator Start Frequency Adjust	R5	A4 Band 3 Oscillator Driver	5-3.5.3
Band 3 Oscillator Stop Frequency Adjust	R25	A4 Band 3 Oscillator Driver	5-3.5.3
Band 3 Oscillator Limit Frequency Adjust	R30	A4 Band 3 Oscillator Driver	5-3.5.3
Continuous Sweep Lower End Frequency Adjust	A1R54	A1 Continuous Sweep Mother Board	5-3.6.1
Continuous Sweep Upper End Frequency Adjust	A1R32	A1 Continuous Sweep Mother Board	5-3.6.1
Band 1/Band 2 Crossover Frequency Adjust	A1R68	A1 Continuous Sweep Mother Board	5-3.6.2
Band 1 Sequential Stop Frequency Adjust	A1R38	A1 Continuous Sweep Mother Board	5-3.6.2
Band 2 Sequential Start Frequency Adjust	A1R66	A1 Continuous Sweep Mother Board	5-3.6.2
Band 2/Band 3 Crossover Frequency Adjust	A1R69	A1 Continuous Sweep Mother Board	5-3.6.2
Band 2 Sequential Stop Frequency Adjust	A1R35	A1 Continuous Sweep Mother Board	5-3.6.2
Band 3 Sequential Start Frequency Adjust	A1R67	A1 Continuous Sweep Mother Board	5-3.6.2
Sweep Speed Limit Adjust	A1R149	A1 Continuous Sweep Mother Board	5-3.7
Modulator Bias Adjust	A1R53	A1 Continuous Sweep Mother Board	5-3.8

*Selection of Oscillator Driver Components, Section VI

are not generated within the spectrum analyzer, and are not within 1 MHz of the carrier frequency, are ≥ 60 dB down from carrier level.

36. Set the output frequency to 13 GHz.

37. Check the second harmonic frequency at 26 GHz and the third harmonic frequency at 39 GHz. Verify the harmonics are ≥ 25 dB below the log reference level.

38. Set the output frequency to 18 GHz and check the second harmonic level at 36 GHz; verify it is ≥ 25 dB below the log reference level.

5-3. CALIBRATION

5-3.1 General

This paragraph contains instructions for calibrating the internal circuitry of the Model 572A-17; these procedures are listed in Table 5-3. Recalibration is necessary after parts have been replaced or when periodic performance checks reveal out-of-tolerance conditions.

Several procedures which are not required during normal calibration are also listed in Table 5-3 for the convenience of calibration personnel; these procedures relate to the selection of certain fixed-value components which may be necessary after the replacement of an oscillator module.

5-3.2 Equipment Required for Calibration

Table 5-4 lists items of test equipment required for calibration of the 572A-17 RF plug-in.

Table 5-4. Test Equipment Required for Calibration

ITEM	TYPE OF EQUIPMENT	CHARACTERISTICS	RECOMMENDED MODEL*
1	Sweeper Mainframe	572A-17 compatible	Systron Donner 540B
2	Frequency Counter	2 to 18 GHz	Systron Donner 6054B
3	Cavity Wavemeter	< 8 to > 12.4 GHz	Hewlett Packard 537A
4	Cavity Wavemeter	< 12.4 to > 18 GHz	Systron Donner DBF-710
5	Spectrum Analyzer	8 to 16 GHz	Systron Donner 4809B with 2311 and 4701
6	Oscilloscope	High sensitivity	Tektronix 544/1A7A or 5000-series mainframe with two amplifiers (5A45)

Table 5-4. Test Equipment Required for Calibration (Continued)

ITEM	TYPE OF EQUIPMENT	CHARACTERISTICS	RECOMMENDED MODEL*
7	Crystal Detector	2 to 18 GHz;Type N connector	Hewlett Packard 8470A -012
8	RF Attenuator	10 dB, 2 to 18 GHz; Type N connector	Systron Donner 441-10
9	Digital Voltmeter	12,999 counts	Systron Donner 7004A
10	Precision DC Supply	Adjustable 9 to 12 ± .05 Vdc	Systron Donner PLS 50-1 or M106B
11	RF Cable	50Ω; APC-7 connector one end, Type N other	As required
12	RF Cables	50Ω; BNC to BNC	As required
13	RF Adapters	50Ω; between-series	As required

*Equipment having equivalent characteristics may be substituted

5-3.3 Location of Components and Adjustments

As an aid to calibration and repair, the locations of major components and subassemblies and all reference test points and adjustments are shown in Figure 5-1. The reference test points shown are component leads and interconnection eyelets; the plug-in does not utilize test point devices. The electrical locations of these reference test points are shown in the schematic diagrams of "mother board" A1 (Figure 8-3) and oscillator driver boards A2 (Figure 8-4), A3 (Figure 8-5), and A4 (Figure 8-6).

The adjustment potentiometers are designed to be operated with a small plastic screwdriver. Do not attempt to force a potentiometer if resistance is met, and do not use lacquer, enamel, or any other sealer to hold the potentiometer in place after adjustment.

5-3.4 Setup for Calibration

It is not possible to calibrate the plug-in while it is in place in the mainframe; the Model 593 flexible extension cable, specified as a trouble isolation and repair aid, should not be used for calibration because of possible voltage drops in the wires at high currents.

Prepare the RF plug-in for calibration by placing it in the maintenance configuration shown in Figure 6-3, Section VI.

WARNING

DISCONNECT THE POWER CORD OF THE MAINFRAME BEFORE STARTING THE REQUIRED DISASSEMBLY. THE PLUG-IN CONNECTOR CARRIES LETHAL VOLTAGE LEVELS.

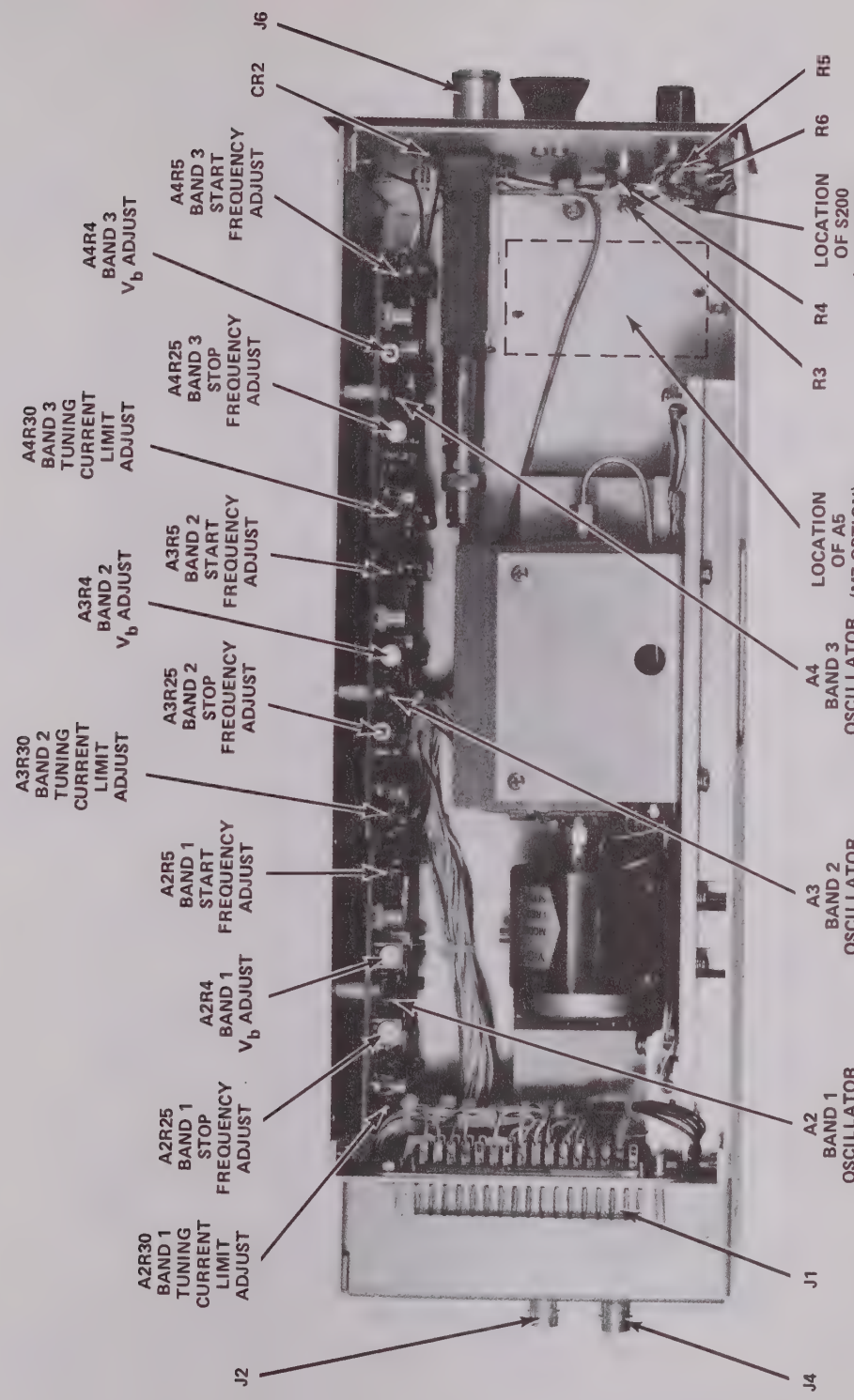

A2R30 BAND 1 TUNING CURRENT LIMIT ADJUST
A2R25 BAND 1 STOP FREQUENCY ADJUST
A2R4 BAND 1 V_b ADJUST
A2R5 BAND 1 START FREQUENCY ADJUST
A3R30 BAND 2 TUNING CURRENT LIMIT ADJUST
A3R25 BAND 2 STOP FREQUENCY ADJUST
A3R4 BAND 2 V_b ADJUST
A3R5 BAND 2 START FREQUENCY ADJUST
A4R30 BAND 3 TUNING CURRENT LIMIT ADJUST
A4R25 BAND 3 STOP FREQUENCY ADJUST
A4R4 BAND 3 V_b ADJUST
A4R5 BAND 3 START FREQUENCY ADJUST
J2
J1
J4
J6
CR2
R3
R4
R5
R6
A2 BAND 1 OSCILLATOR DRIVER
A3 BAND 2 OSCILLATOR DRIVER
A4 BAND 3 OSCILLATOR DRIVER
LOCATION OF A5 (M7 OPTION)
LOCATION OF S200 (M7 OPTION)

Figure 5-1. Location of Components, Adjustments, and Reference Test Points (Sheet 1 of 4)

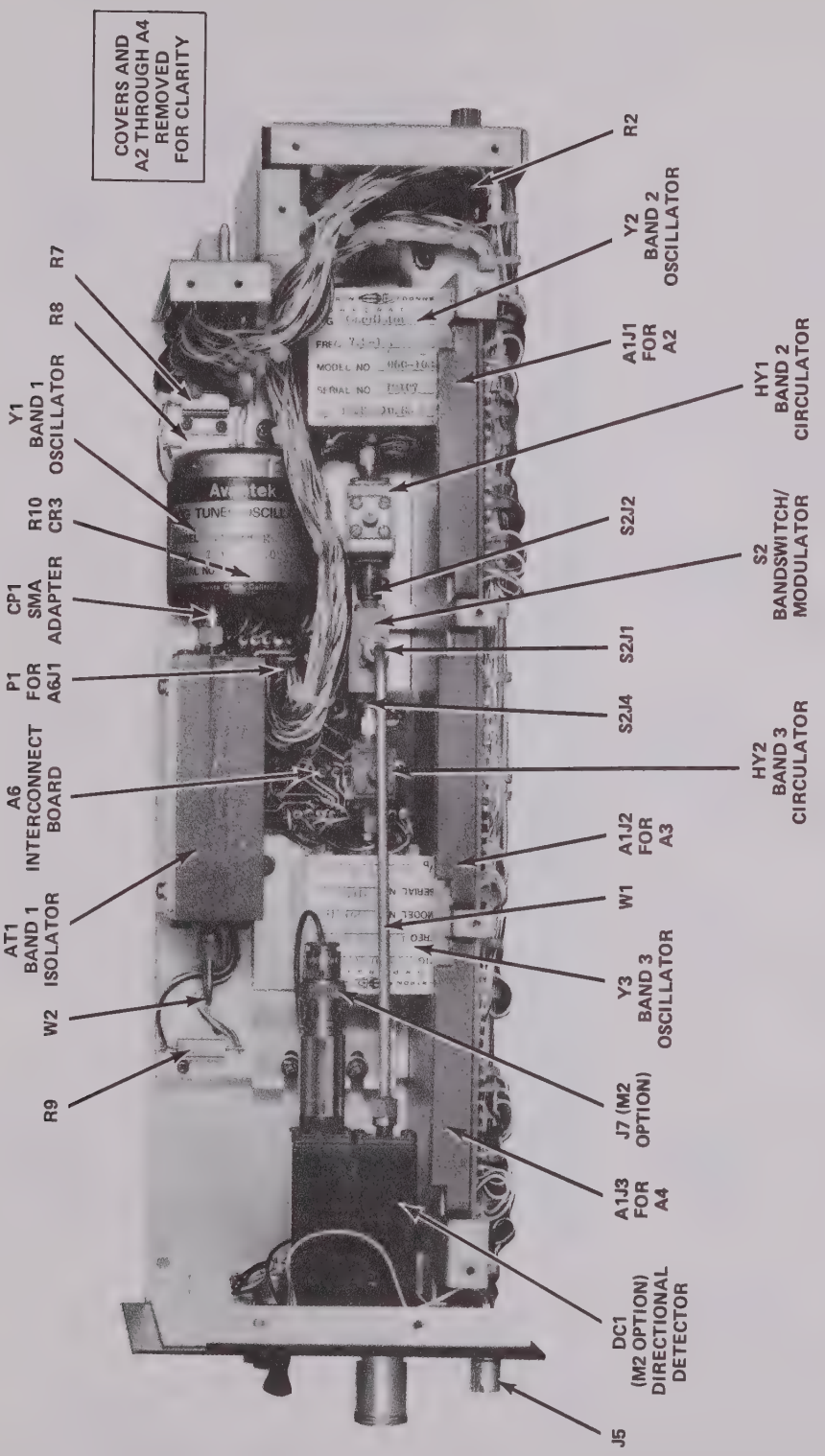


Figure 5-1. Location of Components, Adjustments, and Reference Test Points (Sheet 2 of 4)

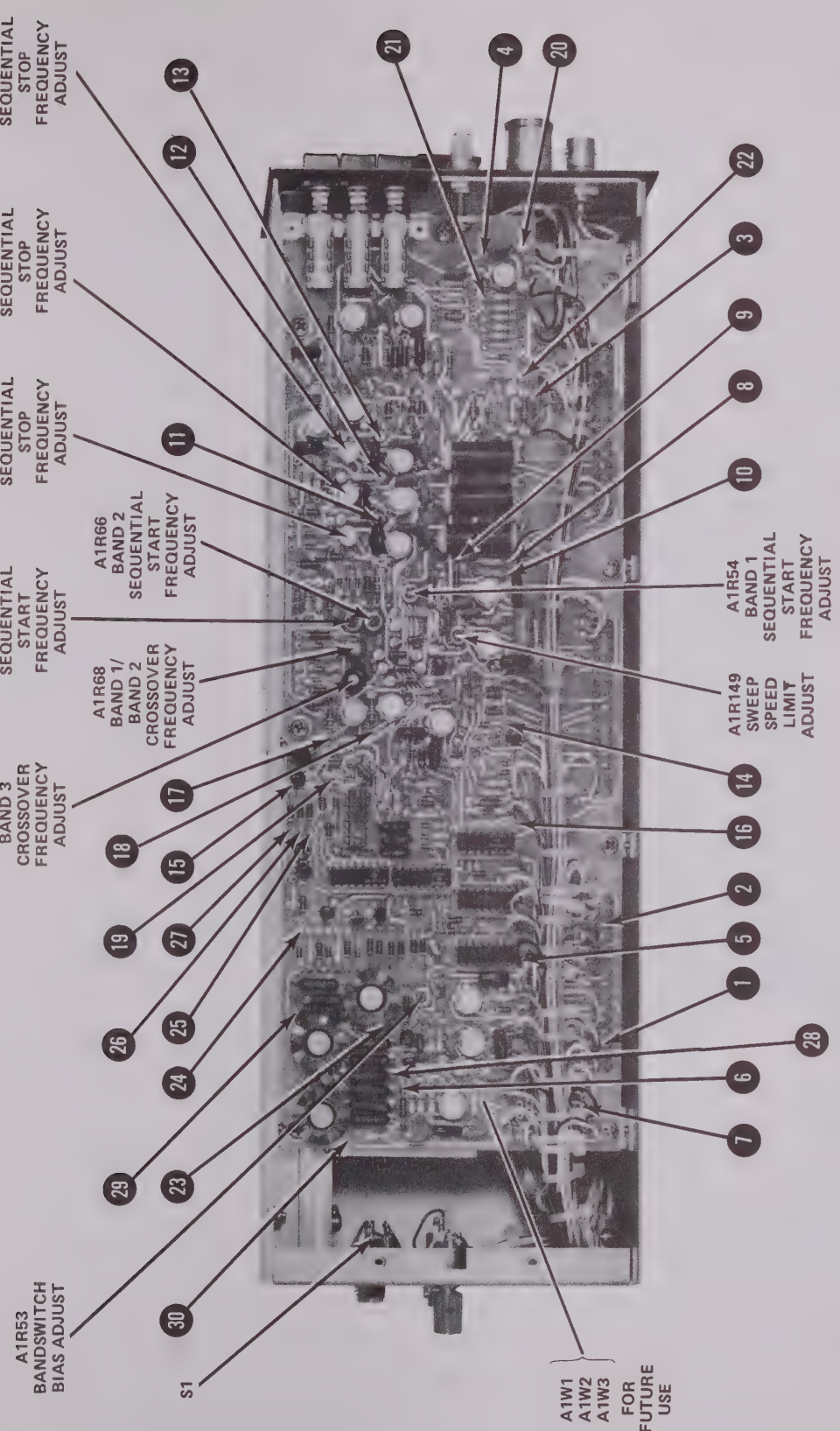


Figure 5-1. Location of Components, Adjustments, and Reference Test Points (Sheet 3 of 4)

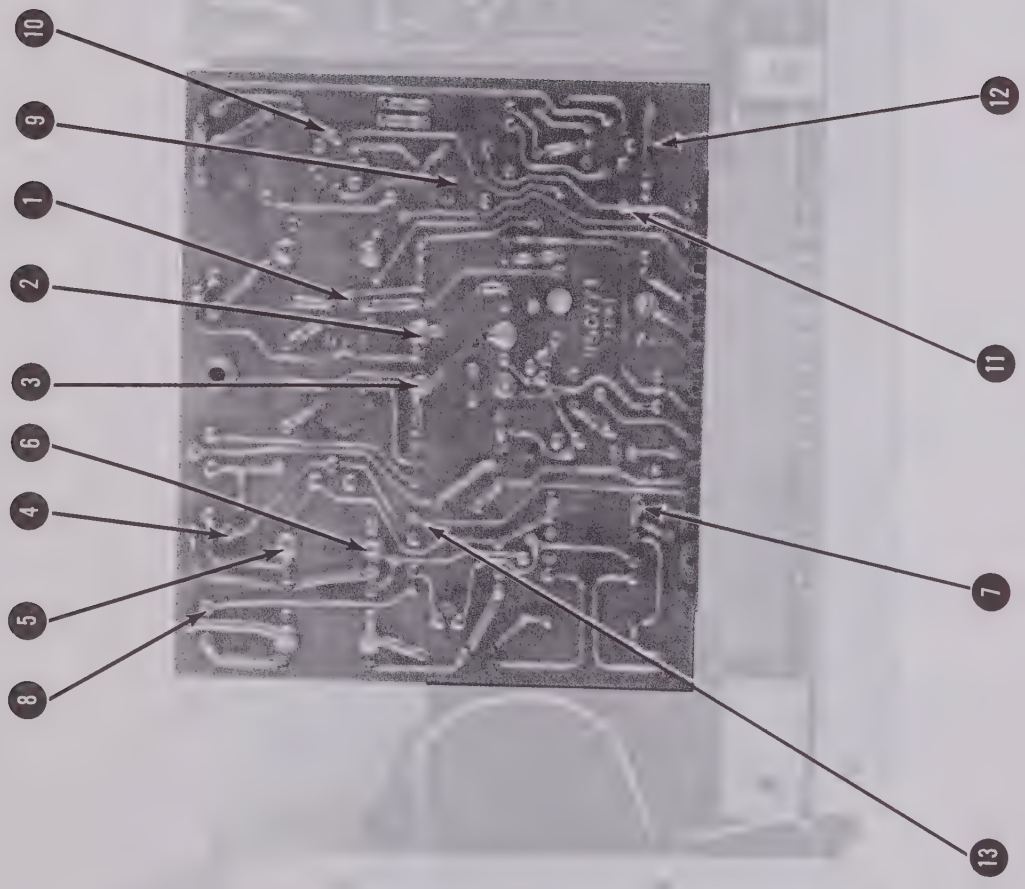


Figure 5-1. Location of Components, Adjustments, and Reference Test Points (Sheet 4 of 4)

Make the following connections and control settings:

1. Ensure mainframe power is off.
2. Depress and latch the MODULATION MODE CW pushbutton.
3. Set the BAND SELECT switch to Band 1.
4. Press and release the RETRACE pushbutton.
5. Depress and latch the EXT TRIGGER pushbutton.
6. Depress and latch the CW SWEEP MODE pushbutton.
7. Depress and latch the FAST SWEEP pushbutton.
8. Depress and latch the INT LEVELING pushbutton. If the plug-in is not equipped with Internal Leveling Option M2, use a Model 1021 or other suitable external directional detector and depress the EXT LEVELING pushbutton. Connect as shown in Figure 5-2.
9. Connect a 10 dB attenuator to the RF OUT connector or external leveler.
10. Set the POWER control fully CCW.

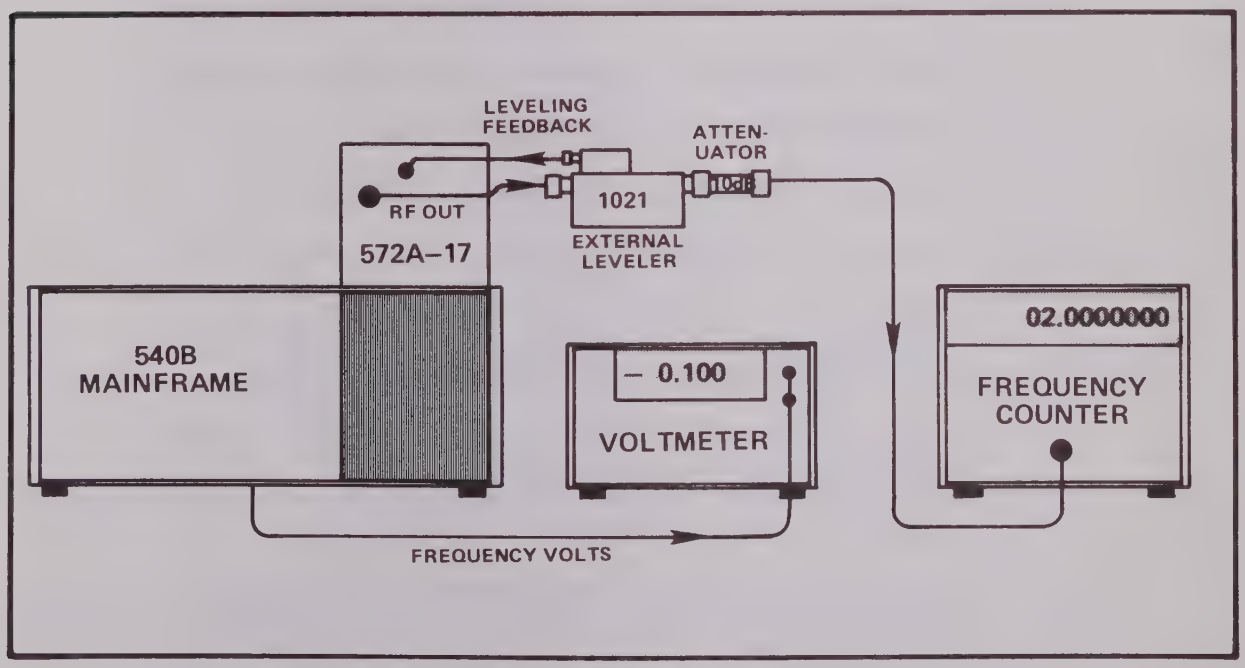


Figure 5-2. Test Setup for Oscillator Driver Calibration

11. Connect a cable from the output of the attenuator to the input of the frequency counter.

12. Connect a cable from the mainframe rear-panel FREQUENCY VOLTS connector to the digital voltmeter input. Set the voltmeter to its 10 Vdc range.

13. Connect the output of the power supply to the mainframe rear-panel EXT TUNE connector (positive side to ground).

14. Turn mainframe power on and allow the units to stabilize for approximately 5 minutes.

5-3.5 Oscillator Driver Board Calibration (Figure 5-1)

5-3.5.1 BAND 1.

1. Adjust the CW control for a voltmeter reading of -9.9 Vdc ±1 mVdc.

2. Connect the positive lead of the voltmeter to A2TP6 (V_b) and the negative lead to A2TP13 (V_b return).

3. Adjust A2R4 for a voltmeter reading which matches the specified V_b printed on the nameplate label of oscillator Y1 or shown on the test data sheet supplied with the oscillator. If no voltage specifications are shown, adjust A2R4 for a voltage of +15 Vdc ±50 mVdc.

4. Reconnect the voltmeter to the FREQUENCY VOLTS jack.

5. Set the POWER control to provide a stable counter reading.

6. Adjust the CW control for -100 mVdc ±100 μVdc.

7. Adjust A2R25 for a frequency of 2000 ±10 MHz.

8. Adjust the CW control for -9.9 Vdc ±1 mVdc.

9. Adjust A2R25 for a frequency of 8000 ±40 MHz.

10. Adjust the power supply for a voltmeter reading of approximately -9 Vdc.

11. Depress and latch the SWEEP MODE EXT TUNE pushbutton.

12. Monitor the output frequency of the plug-in while increasing the output voltage of the power supply.

13. Adjust A2R30 so that the RF output frequency does not increase further (or disappears from the counter readout entirely) under one of the following conditions:

    a. The RF output frequency has risen to 8100 MHz, or

    b. The power supply output has risen to -12 Vdc ±50 mVdc.

14. Turn off mainframe power.

15. Depress and latch the CW SWEEP MODE pushbutton.

16. After at least 15 seconds, turn mainframe power on.

17. Repeat steps 1 through 16.

5-3.5.2 BAND 2.

1. Set the BAND SELECT switch to Band 2.

2. Adjust the CW control for a voltmeter reading of -100 mVdc ±100 μVdc.

3. Connect the positive lead of the voltmeter to A3TP6 (V_b) and the negative lead to A3TP13 (V_b return).

4. Adjust A3R4 for a voltmeter reading which matches the specified V_b printed on the nameplate label of oscillator Y2. If two voltages are shown, adjust A3R4 to match the higher voltage ±50 mVdc.

5. Reconnect the voltmeter to the FREQUENCY VOLTS jack.

6. Set the POWER control to provide a stable counter reading.

7. Adjust A3R5 for a frequency of 8000 ±40 MHz.

8. Adjust the CW control for -9.9 Vdc ±1 mVdc.

9. Adjust A3R25 for a frequency of 12,4000 ±52 MHz.

10. Adjust the power supply for a voltmeter reading of approximately -9 Vdc.

11. Depress and latch the SWEEP MODE EXT TUNE pushbutton.

12. Monitor the output frequency of the plug-in while increasing the output voltage of the power supply.

13. Adjust A3R30 so that the RF output frequency does not increase further (or disappears from the counter readout entirely) under one of the following conditions:

    a. The RF output frequency has risen to 12,600 MHz, or

    b. The power supply output has risen to -12 Vdc ±50 mVdc.

14. Turn off mainframe power.

15. Depress and latch the CW SWEEP MODE pushbutton.

16. After at least 15 seconds, turn mainframe power on.

17. Repeat steps 2 through 16.

5-3.5.3 BAND 3.

1. Set the BAND SELECT switch to Band 3.
2. Adjust the CW control for a voltmeter reading of -100 mVdc ±100 μVdc.
3. Connect the positive lead of the voltmeter to A4TP6 (V_b) and the negative lead to A4TP13 (V_b return).
4. Adjust A4R4 for a voltmeter reading which matches the specified V_b printed on the nameplate label of oscillator Y3. If two voltages are shown, adjust A4R4 to match the higher voltage ±50 mVdc.
5. Reconnect the voltmeter to the FREQUENCY VOLTS jack.
6. Set the POWER control to provide a stable counter reading.
7. Adjust A4R4 for a frequency of 12,400 ±62 MHz.
8. Adjust the CW control for -9.9 Vdc ±1 mVdc.
9. Adjust A4R25 for a frequency of 18,000 ±90 MHz.
10. Adjust the power supply for a voltmeter reading of approximately -9 Vdc.
11. Depress and latch the SWEEP MODE EXT TUNE pushbutton.
12. Monitor the output frequency of the plug-in while increasing the output voltage of the power supply.
13. Adjust A4R30 so that the RF output frequency does not increase further (or disappears from the counter readout entirely) under one of the following conditions:
    a. The RF output frequency has risen above 18,500 MHz, or
    b. The power supply output has risen to -12 Vdc ±50 mVdc.
14. Turn off mainframe power.
15. Depress and latch the CW SWEEP MODE pushbutton.
16. After at least 15 seconds, turn mainframe power on.
17. Repeat steps 2 through 16.

5-3.6 Continuous Sweep Adjustments

The following procedures make use of absorption-type coaxial frequency meters (wavemeters) to set band crossovers and frequency limits in continuous sweep mode. A frequency counter is used in addition to the wavemeters, or may be used instead of the wavemeters.

5-3.6.1 END FREQUENCY ADJUSTMENTS.

1. Connect the test equipment as shown in Figure 5-2. It is not necessary to use an external leveler if the plug-in is equipped with Internal Leveling Option M2.

2. Set the BAND SELECT switch to BAND 4.

3. Adjust the CW control for a voltmeter reading of -100 mVdc ±100 μVdc.

4. Adjust A1R54 for a counter reading of 2000 ±20 MHz.

5. Adjust the CW control for a voltmeter reading of -9.9 Vdc ±1 mVdc.

6. Adjust A1R32 for a counter reading of 18,000 ±180 MHz.

5.3.6.2 BAND CROSSOVER ADJUSTMENTS.

1. Connect the equipment as shown in Figure 5-3, using the 4 to 12.4 GHz wavemeter. It is not necessary to use an external leveler if the plug-in is equipped with Option M2.

2. Connect a cable between the mainframe SWEEP OUTPUT connector and the X-axis input of the oscilloscope (adjusted for 1 V/Division).

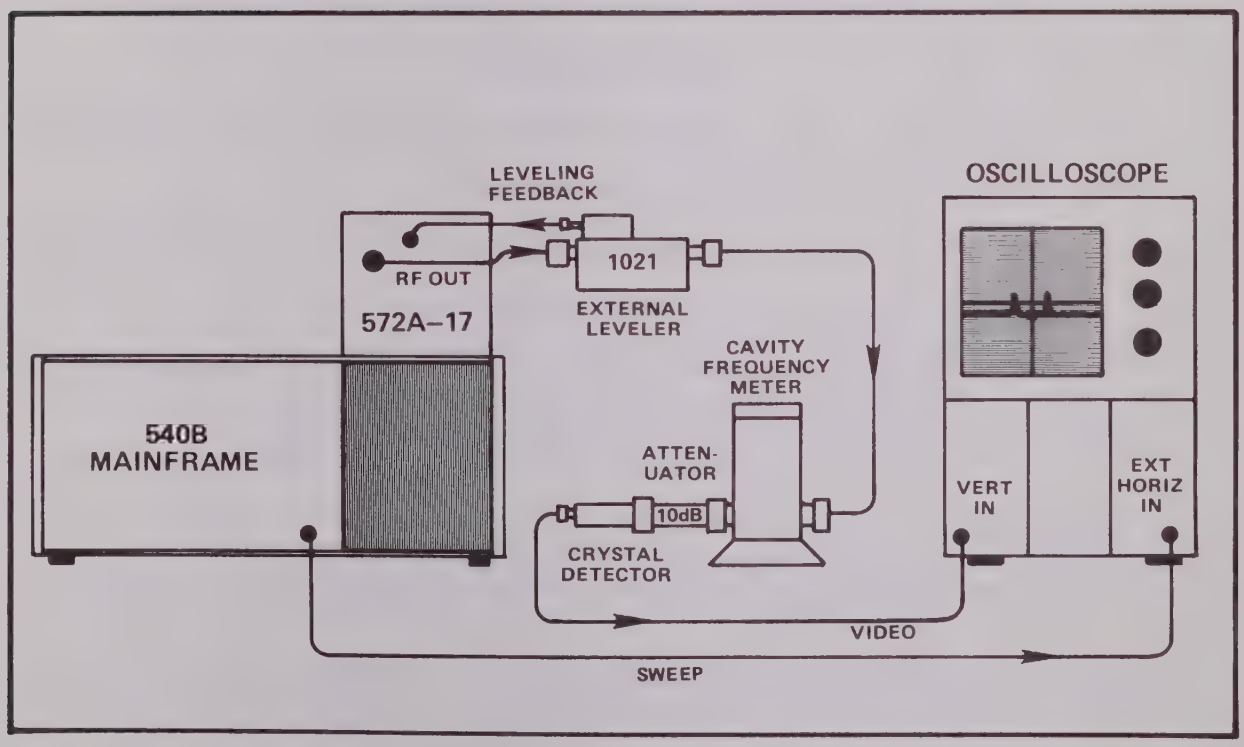


Figure 5-3. Test Setup for Continuous Band Adjustments

3. Set the BAND SELECT switch to Band 4.

4. Adjust the POWER control until the UNLEVELED indicator illuminates, then retard the setting of the POWER control about one dial marking.

5. Set the Fc indicator to 8.0 GHz.

6. Set the ΔF WIDTH control to 125 MHz.

NOTE

It is assumed in this procedure that the oscilloscope used has ten X-axis graticule divisions. If the oscilloscope has eight divisions, set the ΔF WIDTH control to 100 MHz.

7. Depress and latch the SWEEP MODE Fc ±ΔF and the INT TRIGGER pushbuttons.

8. Depress and latch the FAST SWEEP pushbutton.

9. Set the wavemeter to 8000 MHz; resolve as closely as possible. If necessary, slightly readjust Fc so that the marker pip is centered in the X-axis of the oscilloscope.

10. Adjust A1R68 so that the bright crossover dot on the CRT trace is exactly aligned with the marker pip from the cavity wavemeter.

11. Set the cavity wavemeter to 8025 MHz.

12. Adjust A1R38 so that the marker pip is directly over the crossover dot.

13. Set the cavity wavemeter to 7975 MHz.

14. Adjust A1R66 so that the marker pip is directly over the crossover dot.

15. Set the cavity wavemeter to 8000 MHz.

16. Verify that two marker pips are present ±1 graticule division (±25 MHz) from the center marking.

17. Set the wavemeter to 12,400 MHz; resolve as closely as possible.

18. Set the Fc indicator to 12.4 GHz.

19. Adjust Fc to place the marker pip directly on the center X-axis graticule marking.

20. Adjust A1R69 so that the bright crossover dot on the CRT trace is exactly aligned with the marker pip.

21. Set the cavity wavemeter to 12,425 MHz.

22. Adjust A1R35 so that the marker pip is directly over the crossover dot.

23. Set the cavity wavemeter to 12,375 MHz. Adjust A1R67 so that the marker pip is directly over the crossover dot.

24. Set the cavity wavemeter to 12,400 MHz.

25. Verify that two marker pips are present ±1 graticule division (±25 MHz) from the center marking.

26. Repeat all of Paragraph 5.3.6.1 and steps 1 through 25 of this paragraph.

5-3.7 Sweep Speed Limit Adjustment

NOTE

This calibration procedure can be performed in a late model 540, 540A, or 540B mainframe, or in a 540-series mainframe which has been modified in accordance with the instructions of Paragraph 6-3.7, Section VI.

1. Connect the test equipment as shown in Figure 5-3, less the external leveler. Depress the OFF LEVELING pushbutton.

2. Set the SWEEP CONTROL to its maximum CCW position.

3. Adjust A1R149 fully CCW.

4. Set the F1-START control fully CCW.

5. Set the F2-STOP control fully CW.

6. Depress the F1-F2 SWEEP MODE pushbutton.

7. Set the cavity wavemeter to ≈ 7 GHz.

8. Set the POWER control to about "8"; adjust the oscilloscope vertical sensitivity to allow maximum resolution of the detected video signal.

9. Advance the SWEEP CONTROL in a CW direction until the forward sweep trace and the reverse sweep (retrace) displayed on the CRT screen begin to diverge from one another.

10. Continue to advance the SWEEP CONTROL in a CW direction until the marker pip at ≈ 7 GHz appears asymmetrical. At this point, the shape of the forward trace will also have begun to distort, masking the amplitude variations of the unleveled output signal.

11. If the effects described above are not evident by the time the SWEEP CONTROL has been set fully CW, reset the cavity wavemeter to ≈ 10 GHz and repeat the procedure.

12. Adjust the SWEEP CONTROL in a CCW direction until the effect is diminished but still evident.

13. Adjust A1R149 CCW until the trace distortion is eliminated. Do not overadjust A1R149 or it will not be possible to use the fastest sweep rates.

14. Advance the SWEEP CONTROL fully CW. Verify that the sweep speed does not increase and that the trace is not distorted.

5-3.8 Modulator Bias Adjustment

1. Adjust the POWER control fully CCW.

2. Press and release the RETRACE pushbutton.

3. Set all sweeper mainframe and RF plug-in controls for a full multiband F1-F2 sweep of 2 to 18.5 GHz. Use internal leveling or install an external leveler and use external leveling.

4. Connect the equipment as shown in Figure 5-3, but do not install the cavity wavemeter. Connect the RF output of the internally-leveled plug-in or external leveler through a 10 dB attenuator to the crystal detector. Load the output of the crystal detector with $\approx$ 1 kΩ to ground (or with the detector manufacturer's specified resistance) for best square-law response.

5. Set the oscilloscope for an ac-coupled input and a vertical sensitivity of $\approx$ 20 mV per division (this may be changed later for best resolution).

6. Advance the POWER control to "5". Continue to advance the control while monitoring the oscilloscope display.

7. At a certain position of the POWER control, the display may begin to change shape. It may appear that the amplitude display has "flipped", or changed polarity about an invisible line running along the X-axis of the display. Amplitude variations which were negative (in the direction of the top of the oscilloscope screen) will reverse direction.

8. If this effect was not noted, or was not noted before the UNLEVELED indicator illuminated, no adjustment is necessary.

9. If the effect was noted, adjust A1R53 to achieve the smoothest leveled output trace.

SECTION VI

MAINTENANCE

6-1. GENERAL

This section contains instructions for routine servicing and cleaning of the instrument and for the isolation and repair of malfunctioning circuits and components.

6-2. ROUTINE MAINTENANCE

In normal laboratory environments, the RF plug-in requires only brief annual service. Ideally, the plug-in and the 540-series mainframe in which it is used should be serviced together. If no service records are kept, a quick check of the RF plug-in's air filter will indicate when cleaning is necessary. If the air filter has taken on a coating of dust, it will show a light beige or light grey color. Inspect the air filter often, and clean it whenever necessary:

1. Turn off sweeper mainframe power, then disconnect the power cord.
2. Loosen the plug-in locking screw and remove the plug-in from the mainframe.
3. Remove the rear panel of the plug-in using the procedures detailed in Figure 6-3.
4. Remove the foam filtering medium and wash it thoroughly in warm water and detergent. Rinse, shake dry, and allow the foam filter to air-dry completely.
5. While the foam is drying, clean the air channel opening in the plug-in with a brush and low-pressure dry air. Vacuum-clean the area around the cooling fan air inlet hole. A mild detergent solution and a clean rag may also be used.
6. Remove the top and bottom covers as shown in Figure 6-3.
7. Inspect the inside of the unit carefully for loose screws, nuts, etc.; tighten any hardware requiring it.
8. Check the unit carefully for damaged or overheated components, pieces of loose solder or wire, frayed wire insulation, etc.
9. Check the DIP integrated circuits and other plug-in components to make sure they are firmly seated in their sockets.
10. Replace the top and bottom covers removed in step 6.
11. After the foam material has completely dried, reinstall the filter and reassemble the plug-in back panel.

IMPORTANT

Do not spray the foam filter with filter coating or any other materials; do not apply oils or adhesives to the filter.

12. Perform the checks detailed in Paragraph 5-2, Section V.

6-3. CORRECTIVE MAINTENANCE

6-3.1 Trouble Isolation (Figure 6-4)

The checks in Section V provide the principal means of determining that electrical performance of the plug-in is within specified parameters. In the event of evident failure or malfunction, certain logical steps must be followed and decisions made to effect repair or correct a malfunction within the shortest period possible. The basic process may be summarized as follows:

1. Does a malfunction in fact exist, or is an evident malfunction the result of incorrect switch or control positioning, incorrect external input signals, or misapplication of the sweeper/plug-in system?

2. If a malfunction does exist, is the fault in the plug-in or in the mainframe?

3. If the malfunction is within the plug-in, in which circuit or circuits is it located?

4. Which components within the affected circuit(s) have malfunctioned?

5. What caused the malfunction, and will simple replacement of faulty components solve the problem permanently?

Figure 6-4 is an aid to trouble isolation, to be used in conjunction with the following information:

1. The detailed circuit descriptions and block diagrams in Section IV.

2. The schematic diagrams and board component-location drawings in Section VIII.

3. The basing diagrams of multi-lead semiconductor devices used in the mainframe and plug-in, shown in Figure 6-1.

Figure 6-4 comprises six separate sequences and several sub-sequences used to isolate malfunctions from the system level, to the malfunctioning circuit, to the malfunctioning individual component. The figure, located at the end of this section, is organized as follows:

1. START Sequence. This sequence is used to direct the troubleshooter to the malfunctioning circuit area within the sweeper mainframe/plug-in system.

2. Sequence A is concerned with active and passive RF components.

3. Sequence B is the troubleshooting figure related to the power supply and current supply circuits within the plug-in.

4. Sequence C covers the single-band tuning circuits and tuning current drivers.

5. Sequence D is used to isolate faults within the continuous sweep (multi-band) circuitry.

6. Sequence E is concerned with the amplitude control and leveling functions.

6-3.2 Test Equipment

The test equipment listed in Table 5-3, Section V, should be used for trouble isolation. In addition, certain specialized equipment may be useful. A logic-state device such as the Hewlett-Packard Model 10528A Logic Clip can aid isolation in digital IC circuits; an extender such as the AP, Inc. 923700 IC Test Clip makes DIP package leads more accessible.

Finally, Tektronix, Inc. manufactures the 015-0201-00 insulator/spacer for attachment to many of their slip-on tip oscilloscope probes. This device reduces the danger of slipping with an oscilloscope probe while measuring in and around DIP packages.

CAUTION

BE VERY CAREFUL WITH OSCILLOSCOPE AND VOLTMETER PROBES TO AVOID ACCIDENTALLY BRIDGING TWO POINTS OR SHORT-CIRCUITING A WIRE OR COMPONENT LEAD TO GROUND. LACK OF ADEQUATE CARE WITH SEMICONDUCTOR AND INTEGRATED CIRCUITS CAN TURN RELATIVELY MINOR PROBLEMS INTO COSTLY EXPERIENCES.

6-3.3 Printed Circuit Board Repair

Repair of the plug-in is limited to location and replacement of defective components. To avoid damage to the printed circuit boards and precision components, solder or remove components only with a low-power (25 to 50 W, 500 to 650° F) soldering iron. Do not use soldering guns or large irons. Use only 60-40 or 63-47 rosin core solder. To remove the integrated circuit operational amplifiers or other multi-lead devices, use a special iron tip that unsolders all leads at the same time (available from Ungar and other manufacturers). Remove excess solder from circuit board holes with a vacuum de-soldering device (available from Edsyn, Ungar, Wen, Viking, etc.).

The digital integrated circuit modules are mounted in sockets to facilitate removal and replacement. These IC's are delicate, and should be removed or inserted only with a tool designed for the purpose.

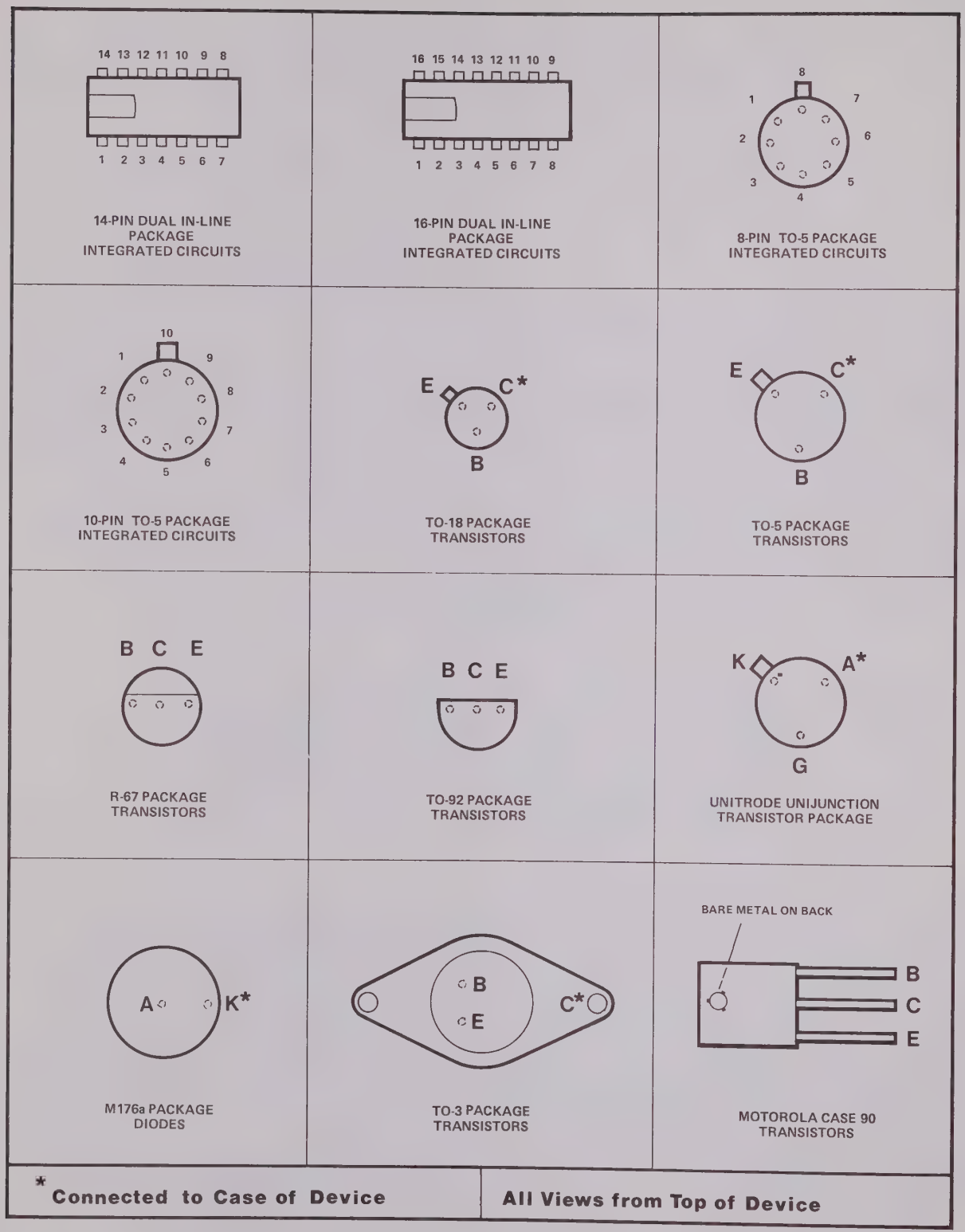


Figure 6–1. Semiconductor Basing Diagram

6-3.4 Contact Pin Replacement

Through wear or damage, the APC-7 inner conductor contact may need replacement. Need for replacement may be manifested as increased output VSWR (excessive ripple or frequency sensitivity in the detected signal), particularly in the 12.4 to 18 GHz band. This contact is a small, four-pronged collet which snaps into a recess in the center conductor (refer to Figure 6-2). This contact is normally held in by the spring action of the four prongs. Examine this contact to determine if it needs replacement. DO NOT REMOVE THIS CONTACT FOR INSPECTION (it may be damaged by removal). The contact should be free of burrs or wear, and the prongs should be equally spaced. If the contact is removed, DO NOT re-use it (it may be damaged by removal). This contact is Amphenol part number 131-1054 or Systron-Donner part number 108151. If the contact needs replacement and a new contact is available, proceed as follows:

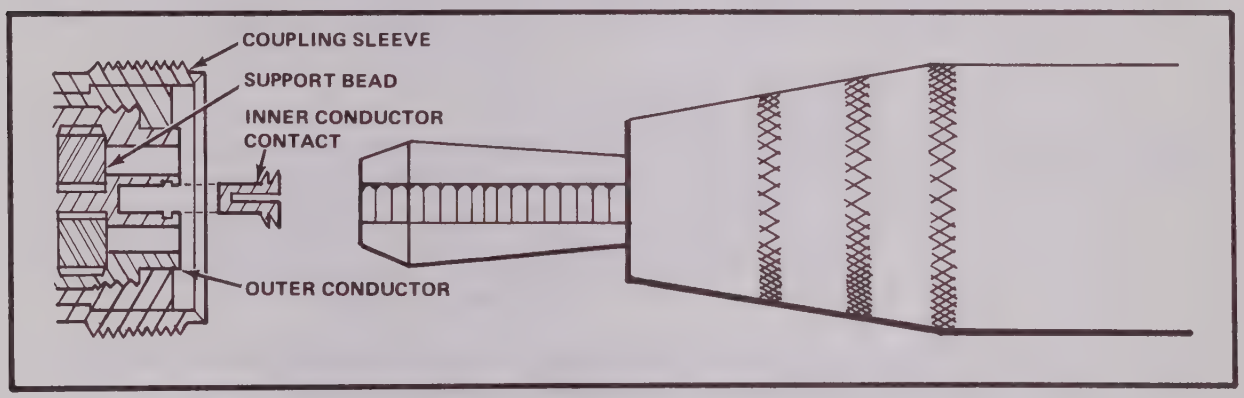


Figure 6-2. APC-7 Connector

1. Remove the plug-in and hold it so the connector faces down.

2. Tap the connector lightly; the contact should now protrude slightly.

3. Amphenol replacement kit 131-2025 contains the extraction, insertion, and disassembly tools used for APC-7 connector service. If the Amphenol tools and instructions are not available, proceed as in steps 4 through 6.

4. Grasp the contact with an ordinary draftsman's mechanical pencil (the end of the jaws may have to be filed to get a good grasp).

5. Allow the jaws of the pencil to close and pull straight away from the connector without twisting. The contact should come with the pencil. If not, repeat the process. Discard the contact to prevent re-use.

6. Snap in a new contact by pushing it lightly into place.

6-3.5 Selection of Oscillator Driver Components

After replacement of an oscillator module, it will probably be necessary to replace certain fixed components on oscillator driver board A2, A3, or A4 before the plug-in can be calibrated:

6-3.5.1 EQUIPMENT REQUIRED. The test equipment and apparatus listed in Table 5-4, Section V, are used to aid in selection of the fixed oscillator driver components when the oscillator modules are replaced.

6-3.5.2 BAND 1 (4 to 8 GHz). The operating voltage of this YIG-tuned transistor oscillator is set to produce the highest power output consistent with coverage of the entire 3.9 to 8.1 GHz operating band; the V_b is programmed to increase with increasing frequency to maintain lowest second harmonic content in the output of the plug-in:

1. Note the rated operating voltage (V_b) on the nameplate of the replacement oscillator. If two voltages are shown, note both. The higher voltage is the operating voltage at the low-frequency end of the band; the lower voltage is used at the high-frequency end of the band.

2. Locate and install a Zener diode in place of CR5 on the oscillator driver board. The new diode must have the following characteristics:

   a. Tolerance of ± 5%
   b. Wattage rating of 1 W
   c. Voltage rating shall be ≈ 1.0 Vdc above the highest rated oscillator operating voltage. In no case shall the voltage of the diode be < 600 m Vdc or > 1.5 Vdc above the rated operating voltage. In practice the next standard JEDEC value above the oscillator voltage rating is usually used (if the oscillator voltage is shown as +15 V, a 16 volt diode would be used).

3. Remove resistor R16 and connect a resistance substitution box to the terminals. Set the resistance value to 20 kΩ initially.

4. Connect the digital voltmeter leads directly to the V_b+ and V_b- terminals of oscillator Y1.

5. Depress and latch the CW SWEEP MODE pushbutton.

6. Set variable resistor R4 on the oscillator driver board to its mid-range point.

CAUTION

RECHECK THE TEST SETUP AND ALL CONNECTIONS BEFORE TURNING ON MAINFRAME POWER. EXCESSIVE OPERATING VOLTAGE OR IMPROPER TEST CONNECTIONS COULD DAMAGE OSCILLATOR, PLUG-IN, OR MAINFRAME CIRCUITRY.

WARNING

WORK WITH CAUTION AROUND THE EXPOSED TERMINALS OF INTERFACE CONNECTION J1. THIS CONNECTOR CARRIES POTENTIALLY LETHAL VOLTAGES AND CURRENTS.

7. Turn the mainframe power on and allow the equipment to warm up for ≈ 5 minutes.

8. Set the BAND SELECT switch to BAND 1.

9. Adjust the CW control so the frequency indicator is directly over the 2.0 GHz dial marking.

10. Select a value for R16 which yields a voltage at the oscillator terminals within ± 0.5 Vdc of the rated operating voltage. If no low-end operating voltage is specified, select a value for R16 which yields a V_b of +10 ± 0.5 Vdc.

11. Adjust the CW control so the frequency indicator is directly over the 8.0 GHz dial marking.

12. Verify the indicated V_b is within ± 0.6 Vdc of the rated high-end operating voltage (if a second voltage level was shown).

13. If adjustment is required, or if no high-end voltage was specified, select a value for R8 which yields a V_b of +15 ± 0.6 Vdc.

14. Depress the F1-F2 SWEEP MODE pushbutton. Release the RETRACE pushbutton.

15. Adjust the F1-START control fully CCW and the F2-STOP control fully CW.

16. Connect the test equipment as shown in Figure 5-3, Section V. Leave the voltmeter attached to the oscillator. V_b + and V_b - terminals.

17. Readjust the value of R16 so that the detected video presentation of the oscilloscope screen shows the maximum average level over the band. Reduce the V_b level if the swept output curve shows oscillator "break-up" - rapid reductions in amplitude over part of the band - or part of the band is missing. Use the cavity wavemeter to verify that the oscillator is being swept over at least the majority of the 2 to 8 GHz band. Exact calibration will be accomplished subsequent to these initial procedures.

18. Depress the MANUAL SWEEP or MANUAL SCAN pushbutton and the RF OFF pushbutton.

19. Disconnect the cavity wavemeter, crystal detector, and oscilloscope.

20. Connect the RF output cable of the plug-in to the input of the spectrum analyzer. Set the RF attenuator of the analyzer for 30 dB initially.

21. Depress and latch the CW MODULATION MODE pushbutton.

22. Select a resistor value for R8 which results in the lowest 8 to 16 GHz second-harmonic content as the plug-in is manually tuned over the 4 to 8 GHz band (the oscillator is not programmed from 2 to 4 GHz).

23. Repeat steps 9 through 22.

24. Solder the components selected for CR5, R16, and R8 permanently in place.

25. Reinstall the oscillator driver board.

26. Verify the V_b levels are correct within ± 0.5 Vdc at the low-frequency end and within ± 0.6 Vdc at the high-frequency end.

27. Complete the calibration with the procedure of Paragraph 5-3.5.1, Section V.

6-3.5.2 BAND 2 (8 to 12.4 GHz)

The operating voltage of this YIG-tuned Gunn-diode oscillator is set and programmed to produce the highest output power consistent with complete coverage of the entire 7.9 to 12.5 GHz operating band:

1. Note the rated operating voltage (V_b) on the nameplate of the replacement oscillator and/or on the test data sheet supplied with the replacement oscillator. If two voltages are shown, note both. The higher voltage is the operating voltage at the low-frequency end of the band; the lower voltage is used at the high-frequency end of the band.

2. Locate and install a Zener diode in place of CR5 on the oscillator driver board. The new diode must have the following characteristics:

   a. Tolerance of ±5%
   b. Wattage rating of 1W
   c. Voltage rating shall be ≈ 1.0 Vdc above the rated oscillator operating voltage. In no case shall the voltage of the diode be < 600 m Vdc or > 1.5 Vdc above the rated operating voltage. In practice the next standard JEDEC value above the oscillator voltage rating is usually used (if the oscillator voltage is shown as +13.6, a 15-volt diode would be used).

3. Remove resistor R16 and connect a resistance substitution box to the terminals. Set the resistance value to 20 kΩ initially.

4. Connect the digital voltmeter leads directly to the V_b + and V_b - terminals of the oscillator.

5. Depress and latch the CW SWEEP MODE pushbutton.

6. Set variable resistor R4 on the oscillator driver board to its mid-range point.

CAUTION

RE-CHECK THE TEST SETUP AND ALL CONNECTIONS BEFORE TURNING ON MAINFRAME POWER . EXCESSIVE OPERATING VOLTAGE OR IMPROPER TEST CONNECTIONS COULD DAMAGE OSCILLATOR, PLUG-IN, OR MAINFRAME CIRCUITRY.

WARNING

WORK WITH CAUTION AROUND THE EXPOSED TERMINALS OF INTERFACE CONNECTION J1. THIS CONNECTOR CARRIES POTENTIALLY LETHAL VOLTAGES AND CURRENTS.

7. Turn the mainframe power on and allow the equipment to warm up for ≈ 5 minutes.

8. Set the BAND SELECT switch to Band 2.

9. Adjust the CW control so the frequency indicator is directly over the 7.9 GHz dial marking.

10. Select a value for R16 which yields a voltage at the oscillator terminals which is within ± 0.5 Vdc of the rated operating voltage.

11. Adjust the CW control so the frequency indicator is directly over the 12.5 GHz dial marking.

12. Verify the indicated V_b is within ± 0.6 Vdc of the rated high-end operating voltage (if a second voltage level was shown).

13. If adjustment is required, select a new value for resistor R15 to program the high-end voltage.

14. Depress the F1-F2 SWEEP MODE pushbutton and release the RETRACE pushbutton.

15. Adjust the F1-START control fully CCW and the F2-STOP control fully CW.

16. Connect the test equipment as shown in Figure 5-3, Section V. Leave the voltmeter attached to the oscillator V_b + and V_b - terminals.

17. Monitor the oscilloscope presentation; if necessary, readjust the values of R16 and R15 so that the detected video presentation on the oscilloscope screen shows the maximum average amplitude over the band. Reduce the V_b if the swept output curve shows oscillator "breakup" - rapid reductions in amplitude over part of the band - or if part of the band is missing. Use the cavity wavemeter to verify that the oscillator is being swept over at least most of the 7.9 to 12.5 GHz band. Exact calibration will be accomplished subsequent to these intiial procedures.

18. Repeat steps 9 through 17.

19. Solder the components selected for CR5, R16, and R15 permanently in place.

20. Reinstall the oscillator driver board.

21. Verify the V_b levels are correct within ± 0.5 Vdc at 7.9 GHz and ± 0.6 Vdc at 12.5 GHz.

22. Complete the calibration procedures of Paragraph 5-3.5.2, Section V.

6-3.5.3 BAND 3 (12.4 to 18 GHz)

The operating voltage of this YIG - tuned Gunn - diode oscillator is set and programmed to produce the highest output power consistent with complete coverage of the entire 12.3 to 18.5 GHz operating band.

1. Note the rated operating voltage (V_b) on the nameplate of the replacement oscillator and/or on the test data sheet supplied with the replacement oscillator. If two voltages are shown, note both. The higher voltage is the operating voltage at the low-frequency end of the band; the lower voltage is used at the high-frequency end of the band.

2. Locate and install a Zener diode in place of CR5 on the oscillator driver board. The new diode must have the following characteristics:

   a. Tolerance of ± 5 %
   b. Wattage rating of 1 W
   c. Voltage rating shall be ≈ 1.0 Vdc above the rated oscillator operating voltage. In no case shall the voltage of the diode be < 600 m Vdc or > 1.5 Vdc above the rated operating voltage. In practice the next standard JEDEC value above the oscillator voltage rating is usually used (if the oscillator voltage is shown as + 13.6, a 15-volt diode would be used).

3. Remove resistor R16 and connect a resistance substitution box to the terminals. Set the resistance value to 20 kΩ initially.

4. Connect the digital voltmeter leads directly to the V_b + and V_b - terminals of the oscillator.

5. Depress and latch the CW SWEEP MODE pushbutton.

6. Set variable resistor R4 on the oscillator driver board to its mid-range point.

CAUTION

RE-CHECK THE TEST SETUP AND ALL CONNECTIONS BEFORE TURNING ON MAINFRAME POWER. EXCESSIVE OPERATING VOLTAGE OR IMPROPER TEST CONNECTIONS COULD DAMAGE OSCILLATOR, PLUG-IN, OR MAINFRAME CIRCUITRY.

WARNING

WORK WITH CAUTION AROUND THE EXPOSED TERMINALS OF INTERFACE CONNECTION J1. THIS CONNECTOR CARRIES POTENTIALLY LETHAL VOLTAGES AND CURRENTS.

7. Turn the mainframe power on and allow the equipment to warm up for ≈ 5 minutes.

8. Set the BAND SELECT switch to Band 3.

9. Adjust the CW control so the frequency indicator is directly over the 12.3 GHz dial marking.

10. Select a value for R16 which yields a voltage at the oscillator terminals which is within ± 0.5 Vdc of the rated operating voltage.

11. Adjust the CW control so the frequency indicator is directly over the 18.5 GHz dial marking.

12. Verify the indicated V_b is within ± 0.6 Vdc of the rated high-end operating voltage (if a second voltage level was shown).

13. If adjustment is required, select a new value for resistor R15 to program the high-end voltage.

14. Depress the F1-F2 SWEEP MODE pushbutton and release the RETRACE pushbutton.

15. Adjust the F1-START control fully CCW and the F2-STOP control fully CW.

16. Connect the test equipment as shown in Figure 5-3, Section V. Leave the voltmeter attached to the oscillator V_b + and V_b - terminals.

17. Monitor the oscilloscope presentation; if necessary, readjust the values of R16 and R15 so that the detected video presentation on the oscilloscope screen shows the maximum average amplitude over the band. Reduce the V_b if the swept output curve shows oscillator "breakup" -rapid reductions in amplitude over part of the band - or if part of the band is missing. Use the cavity wavemeter to verify that the oscillator is being swept over at least most of the 12.3 to 18.5 GHz band. Exact calibration will be accomplished subsequent to these initial procedures.

18. Repeat steps 9 through 17.

19. Solder the components selected for CR5, R16 and R15 permanently in place.

20. Reinstall the oscillator driver board.

21. Verify the V_b levels are correct within ± 0.5 Vdc at 12.3 GHz and ± 0.6 Vdc at 18.5 GHz.

22. Complete the calibration procedures of Paragraph 5-3.5.3, Section V.

6-3.6 Disassembly and Component Removal

Refer to Figure 6-3.

6-3.7 Modification of Early 540-Series Mainframes

Model 540 mainframes below serial number 65 will not accept the sweep speed limiting input from the 572A-17 plug-in (earlier plug-ins in the 572 series were fitted with a REDUCE SWEEP SPEED indicator). These early mainframes can be modified to accept the automatic sweep-speed reduction command; operation with RF plug-ins lacking this feature will not be affected:

1. Disconnect the power cord.

2. Remove the bottom cover of the mainframe.

3. With reference to the schematic diagram of the 540 or 540A and to the parts location drawing of Function Board A2, locate pushbutton switch A2S3 MANUAL SCAN.

4. Check for the presence of resistors A2R93 and A2R94; if these resistors are in place, no modification of the mainframe is required.

5. If the resistors are not in place they must be added. A small terminal or terminal strip may be attached to board A2 using the switch-assembly mounting screw next to A2S3.

IMPORTANT

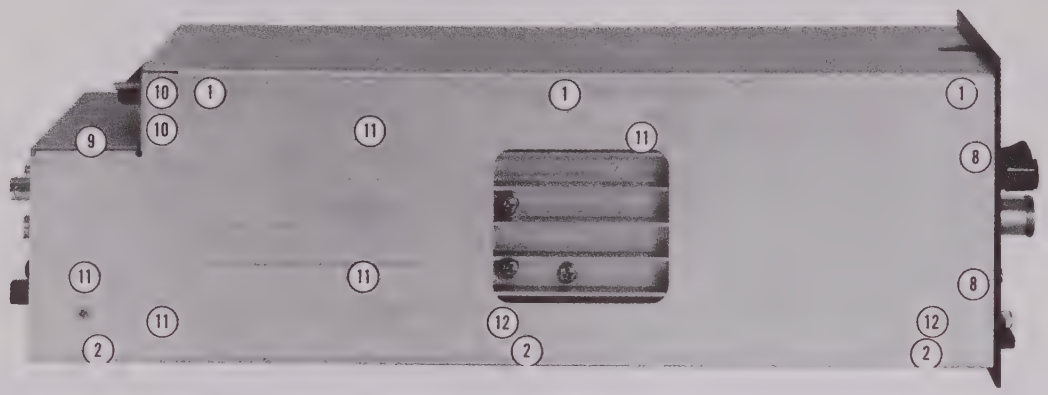
When soldering to the terminals of the pushbutton switch, do not overheat the connection or allow flux or solvent to migrate into the switch body.

6. Solder a 220 kΩ ± 10%, 1/4 W carbon resistor from the common (center) terminal of switch section C to the added terminal.

7. Solder a 5100Ω ± 2%, 1/8 W metal film resistor from the same terminal of the added terminal strip to the common (center) terminal of switch section B or to another convenient board ground point.

8. Connect a wire from the terminal bearing both resistor leads to terminal 23 of interface connector J1. Lace the added wire into the cable assembly.

9. No calibration is required after this modification.



REMOVAL OF TOP COVER

1. Remove seven No. 4-40 x 1/4 in. Phillips-head screws (1)

REMOVAL OF BOTTOM COVER

1. Remove six No. 4-40 x 1/4 in. Phillips-head screws (2)
2. Remove two No. 4-40 x 1/4 in. Phillips-head screws (3)

REMOVAL OF OSCILLATOR DRIVER BOARDS

1. Remove top cover
2. Remove appropriate No. 4-40 x 1/4 in. Phillips-head screws (4)

REMOVAL OF LEFT SIDE COVER

1. Remove top cover
2. Remove bottom cover

Figure 6-3. Disassembly Procedures (Sheet 1 of 7)

3. Remove four No. 4-40 x 3/16 in. Phillips-head screws (5)
4. Remove three No. 4-40 x 1/4 in. Phillips-head screws (6)
5. Remove two No. 4-40 x 1/4 in. Phillips-head screws (7)
6. Remove two No. 4-40 x 1/4 in. Phillips-head screws (8)

REMOVAL OF REAR PANEL ASSEMBLY

1. Remove three No. 4-40 x 1/4 in. Phillips-head screws (6)
2. Remove one No. 4-40 x 1/4 in. Phillips-head screw (9)

REMOVAL OF CONNECTOR PANEL

1. Remove two No. 4-40 x 1/4 in. Phillips head screws (7)
2. Remove two No. 4-40 x 1/4 in. Phillips-head screws (10)

REMOVAL OF FRONT PANEL ASSEMBLY

1. Remove four No. 4-40 x 1/4 in. Phillips-head screws (8)
2. Disconnect coaxial cable W1 (25) from coaxial switch S2 (26) inside unit. Use a 5/16 inch end wrench.

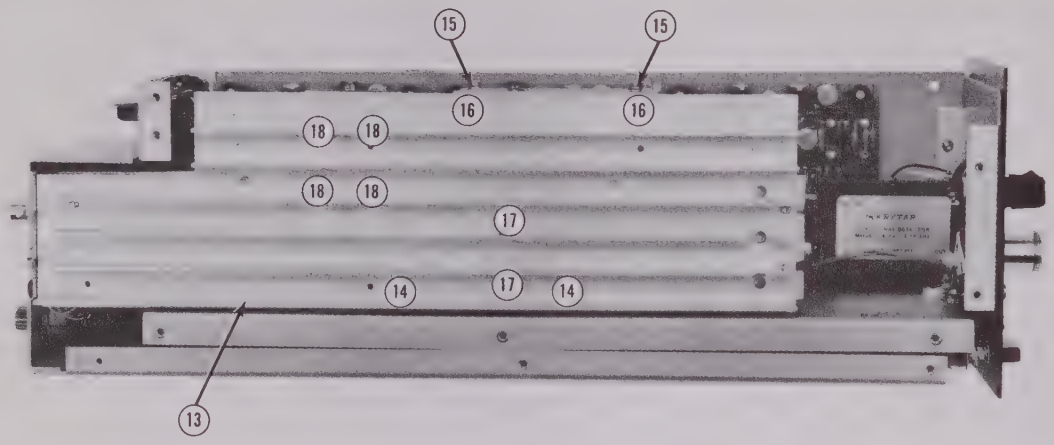
REMOVAL OF RIGHT SIDE COVER

1. Remove three No. 4-40 x 1/4 in. Phillips-head screws (1)
2. Remove three No. 4-40 x 1/4 in. Phillips-head screws (2)
3. Remove two No. 4-40 x 1/4 in. Phillips-head screws (8)
4. Remove one No. 4-40 x 1/4 in. Phillips-head screw (9)
5. Remove two No. 4-40 x 1/4 in. Phillips-head screws (10)
6. Remove four No. 4-40 x 1/4 in. Phillips-head screws (11)
7. Remove three No. 4-40 x 1/4 in. Phillips-head screws (12)

REMOVAL OF A6 INTERCONNECT BOARD

1. Remove two No. 8-32 x 9/16 in. Phillips-head screws (17)
2. Remove Band 1 circulator AT1 (19) :
   a. Remove two No. 4-40 x 5/16 in. Phillips-head screws (15)
   b. Remove two No. 6-32 x 3/8 in. Phillips-head screws (16)
   c. Disconnect SMA connector (20) from mating connector (21)
   d. Disconnect SMA connector (22) from mating connector (23)
3. Disconnect P1 from A6J1.
4. A6 components may be removed and replaced without completely removing the interface board from the plug-in. If replacement of the entire assembly is necessary:
   a. Tag each wire connected to A6 to show the terminal number to which it connects.
   b. Unsolder each wire from its terminal.
5. To re-install A6, reverse the procedure.

Figure 6-3. Disassembly Procedures (Sheet 2 of 7)



REMOVAL OF RF DECK ASSEMBLY

1. Disconnect SMA connector (25) from S2J1 (26)
2. Remove two No. 6-32 x 3/8 in. Phillips-head screws (14)
3. Rotate RF deck (13) to clear the chassis of the plug-in

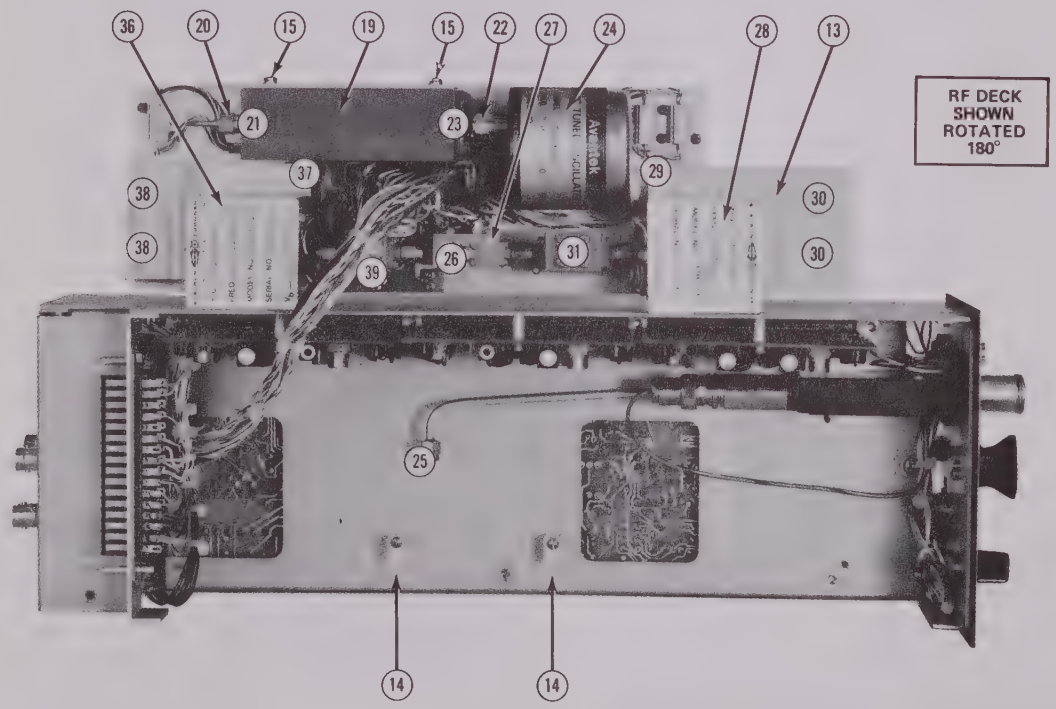


Figure 6-3. Disassembly Procedures (Sheet 3 of 7)

REMOVAL OF BAND 1 OSCILLATOR Y1

1. Loosen but do not remove two 4-40 x 5/16 in. Phillips-head screws (15)
2. Remove four 6-32 x 1/2 in. Phillips-head screws (18)
3. Disconnect SMA Adapter CP1 (22) from mating connector (23). The oscillator output may be checked in this configuration.

   To replace the oscillator:

   a. Pull oscillator module (24) away from RF deck (13)
   b. Disconnect the wiring to Y1
   c. Remove CP1 (22)
   d. Remove Zener diode CR3 (1N5231) and resistor R10 (300 Ω, 3 W). Do not remove any other components from the oscillator terminals.

REPLACEMENT OF BAND 1 OSCILLATOR Y1

1. Refer to the appropriate schematics in Section VIII; solder the power and control wiring to the terminals of Y1. Do not disturb components mounted to the terminals.
2. Install CR2 and R10 to the terminals designated in the schematic diagrams.
3. Install adapter CP1 on the oscillator output connector.
4. Connect CP1 (22) to AT1 (23) ; torque to 8 ±1 in. lb.
5. Reinstall oscillator module (24) with screws (18)
6. Tighten screws (15)
7. Calibrate oscillator driver A2 as detailed in Paragraph 6-3.5.1 of this section.

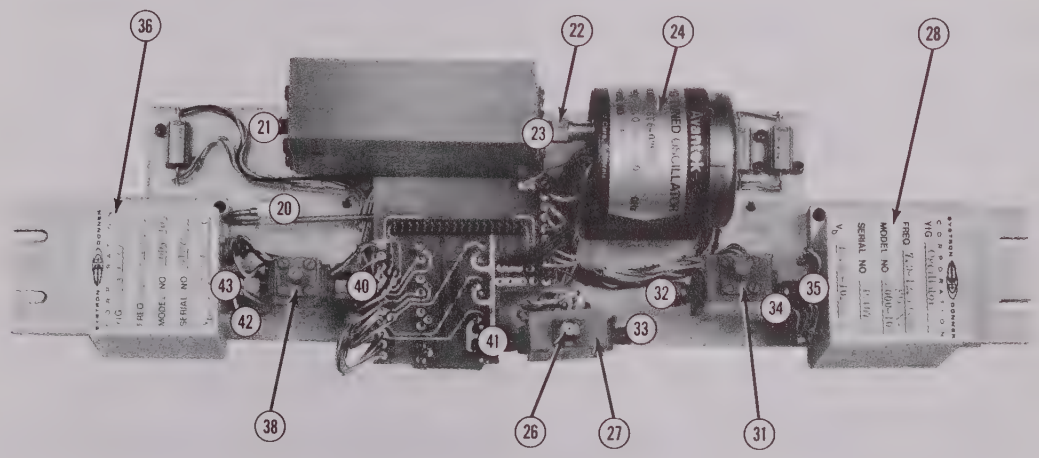


Figure 6-3. Disassembly Procedures (Sheet 4 of 7)

REMOVAL OF BAND 2 OSCILLATOR Y2

1. Remove one No. 6-32 x 3/4 in. Phillips-head screw (29)
2. Loosen two No. 6-32 x 5/8 in. Phillips-head screws (30)
3. Disconnect male SMA connector (32) from S2J2 (33)

   The oscillator output through the circulator may be checked in this configuration; to remove the oscillator:

   a. Remove screws (30)
   b. Disconnect circulator connector (34) from mating oscillator connector (35)
   c. Set circulator HY1 (31) aside, or test it separately as required.
   d. Disconnect the wiring to Y2.
   e. Remove Y2 (28) from its mounting plate by removing four No. 4-40 flat head screws (not shown).
   f. Do not remove the Zener diode attached to the oscillator terminals.

REPLACEMENT OF BAND 2 OSCILLATOR Y2

1. Refer to the appropriate schematics in Section VIII; solder the power and control wiring to the terminals of Y2. Do not disturb the Zener diode mounted to the terminals.
2. Attach circulator HY1 (31) to oscillator Y2 (28) by tightening connector (34) to connector (35) ; torque to 8 ±1 in. lb.
3. Reinstall screws (30)
4. Connect (32) to (33) ; torque to 8 ±1 in. lb.
5. Install screw (29) and tighten; tighten screws (30)
6. Calibrate oscillator driver A3 as detailed in Paragraph 6-3.5.2 of this section.

REMOVAL OF BAND 3 OSCILLATOR Y3

1. Remove one No. 6-32 x 3/4 in. Phillips-head screw (37)
2. Loosen two No. 6-32 x 5/8 in. Phillips-head screws (38)
3. Disconnect male SMA connector (40) from S2J4 (41)

   The oscillator output through the circulator may be checked in this configuration; to remove the oscillator:

   a. Remove screws (38)
   b. Disconnect circulator connector (42) from mating oscillator connector (43)
   c. Set circulator HY2 (39) aside, or test it separately as required.
   d. Disconnect the wiring to Y3.
   e. Remove Y3 (36) from its mounting plate by removing four No. 4-40 flat head screws (not shown).
   f. Do not remove the Zener diode attached to the oscillator.

Figure 6-3. Disassembly Procedures (Sheet 5 of 7)

REPLACEMENT OF BAND 3 OSCILLATOR Y3

1. Refer to the appropriate schematics in Section VIII; solder the power and control wiring to the terminals of Y3. Do not disturb the Zener diode mounted to the terminals.
2. Attach circulator HY2 (39) to oscillator Y3 (36) by tightening connector (42) to connector (43); torque to 8 ± 1 in. lb.
3. Reinstall screws (38)
4. Connect (40) to (41); torque to 8 ± 1 in. lb.
5. Install screw (37) and tighten; tighten screws (38)
6. Calibrate oscillator driver A4 as detailed in Paragraph 6-3.5.3 of this section.

REMOVAL OF BAND SWITCH S2

1. Remove screws (29) and (37)
2. Loosen two screws (30)
3. Loosen two screws (38)
4. Disconnect cable W2 (20) from its mating connector on AT1 (21)
5. Disconnect SMA connector (32) from (33)
6. Slide oscillator (28) to the right.
7. Disconnect SMA connector (40) from (41)
8. Slide oscillator (36) to the left.
9. Rotate band switch S2 (27) away from RF deck (13) to allow disconnection of W1 (not shown).
10. Disconnect the wiring to S2.

REPLACEMENT OF BAND SWITCH S2

1. Refer to the appropriate schematic diagrams in Section VIII and solder the control wiring to the terminals of S2.
2. Reconnect W2 to S2 (27); torque to 8 ± 1 in. lb.
3. Reconnect W2 (20) to HY3 (21); torque to 8 ± 1 in. lb.
4. Reconnect HY1 (32) to S2J2 (33); torque to 8 ± 1 in. lb.
5. Reconnect HY2 (40) to S2J4 (41); torque to 8 ± 1 in. lb.
6. Tighten screws (30) and (38)
7. Readjust the bandswitch/modulator bias voltage as detailed in Paragraph 5-3.8, Section V.

Figure 6-3. Disassembly Procedures (Sheet 6 of 7)

SERVICING RF PLUG-IN

1. Remove power cord from 540-series mainframe.
2. Remove top cover of the mainframe.
3. Remove two No. 4-40 x 5/16 in. screws from rear panel to dismount interface connector J1.
4. Rotate J1 away from the body of the sweeper mainframe.
5. Remove the top cover of the 572A plug-in.
6. Remove the RF deck and place it on the left cover of the plug-in.
7. Connect a flexible SMA cable between S2 and W1; use a female-female adapter if necessary.
8. Connect a No. 16 AWG or heavier test lead from the chassis of the sweeper mainframe to the solder lug mounted on the metal flange of J1.

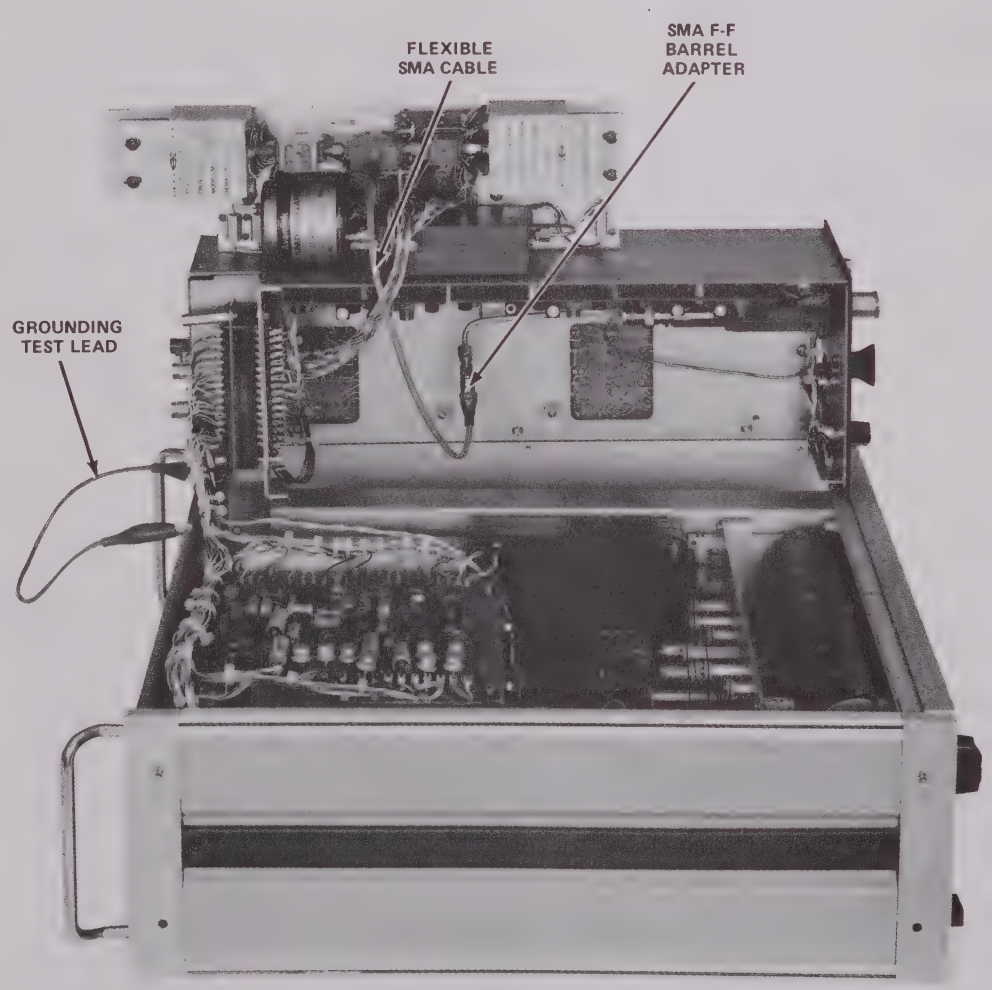


Figure 6-3. Disassembly Procedures (Sheet 7 of 7)

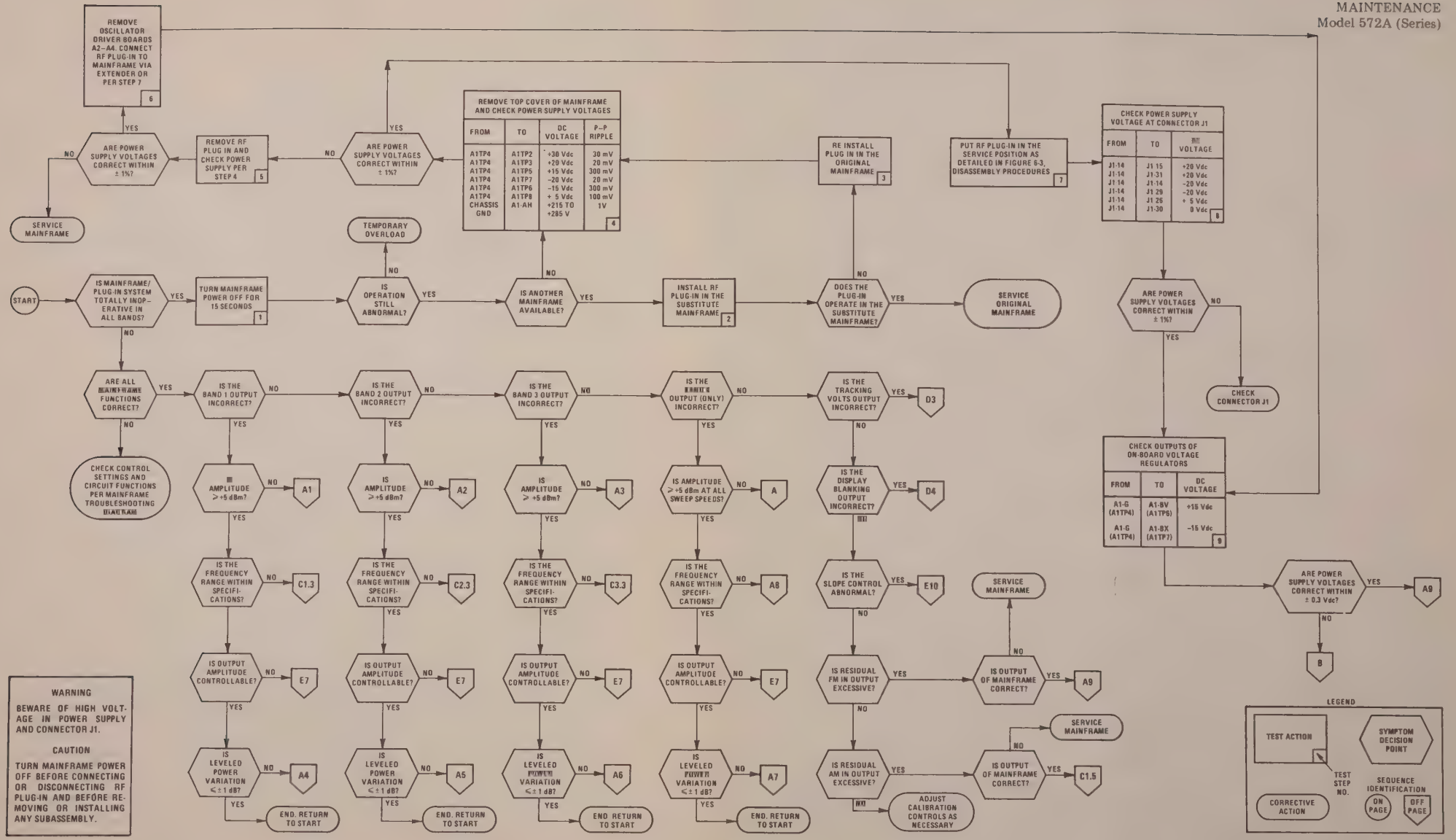


Figure 6-4. Troubleshooting Diagram
Sheet 1

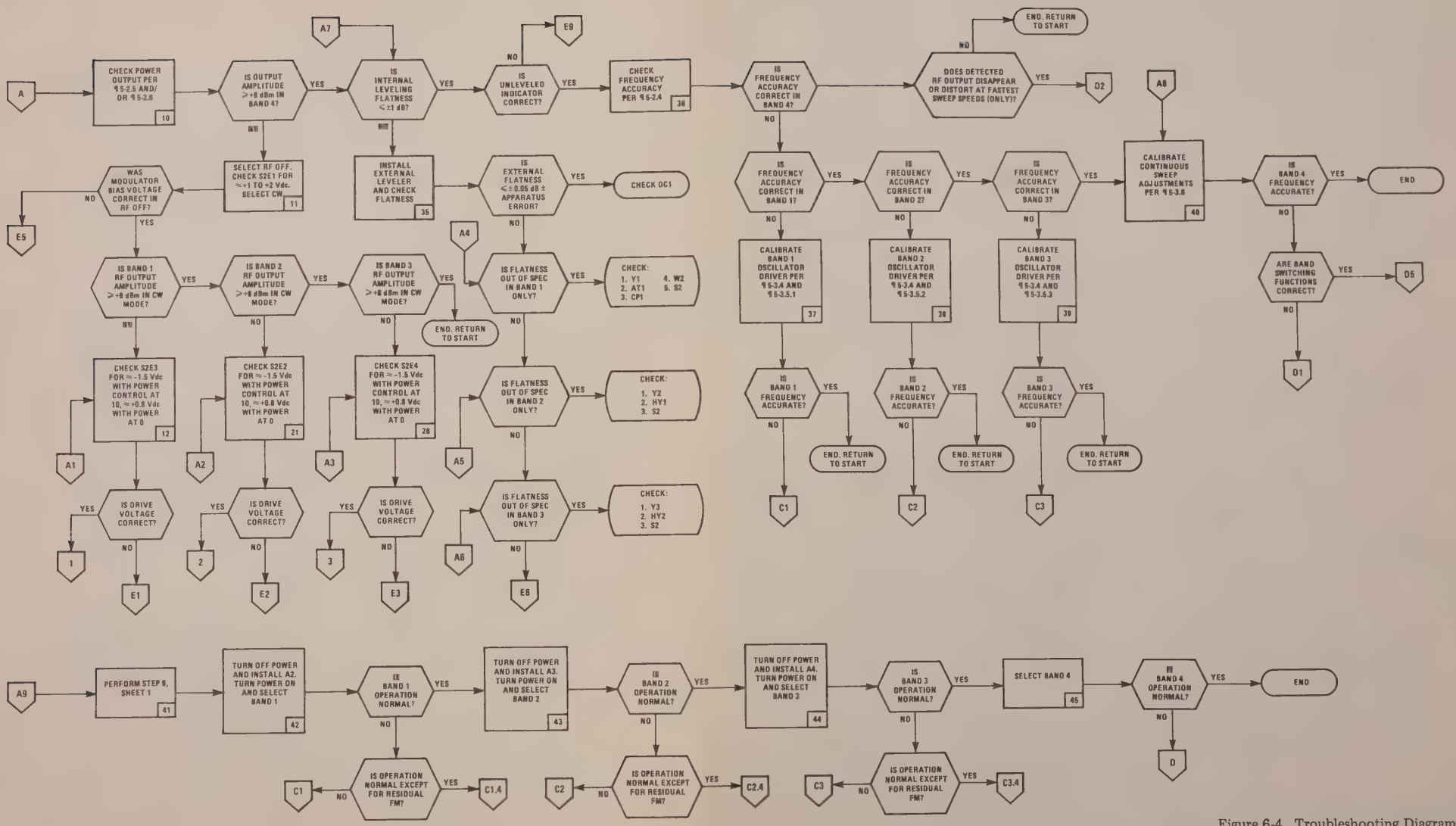


Figure 6-4. Troubleshooting Diagram
Sheet 2

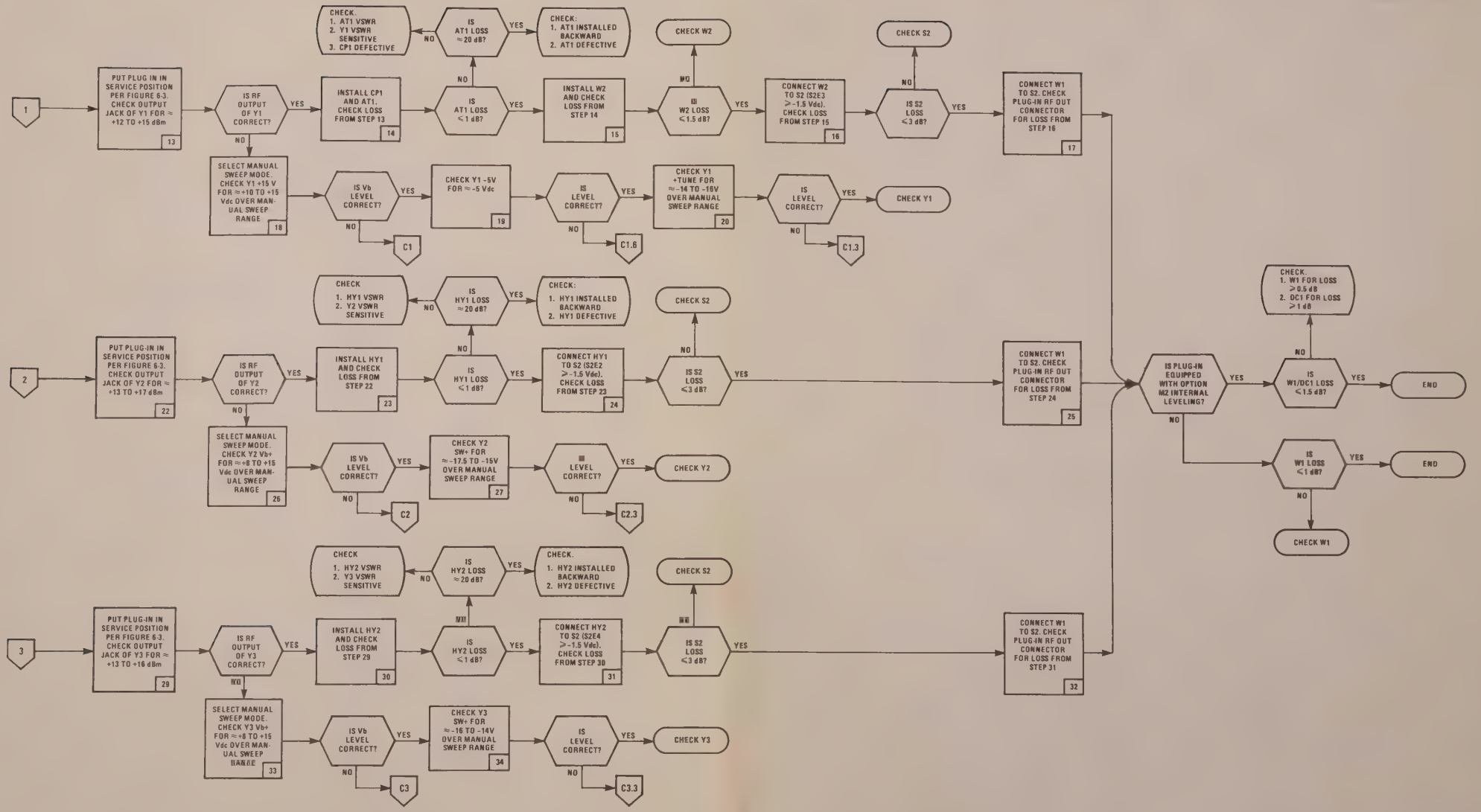


Figure 6-4. Troubleshooting Diagram
Sheet 3

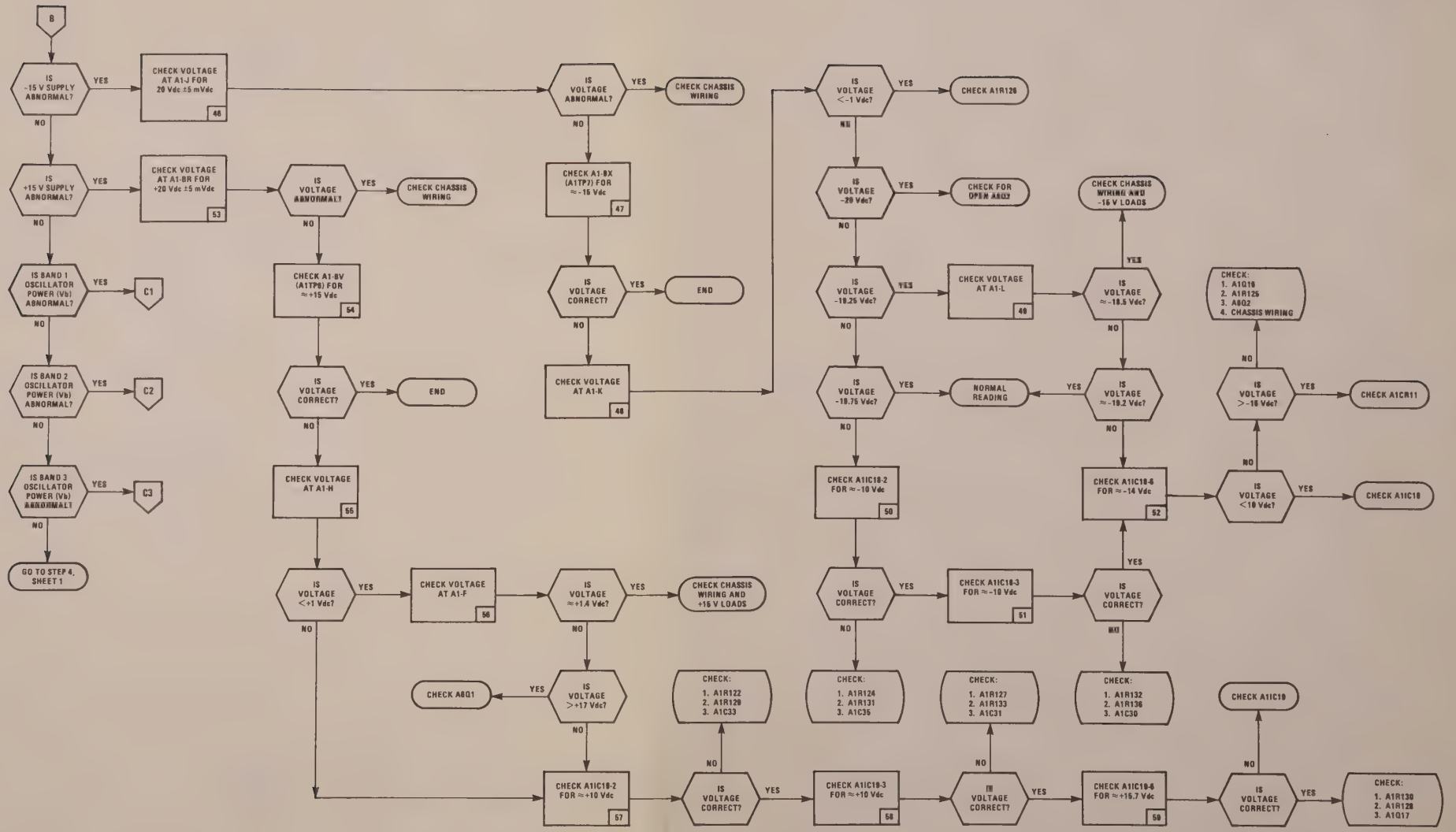


Figure 6-4. Troubleshooting Diagram
Sheet 4

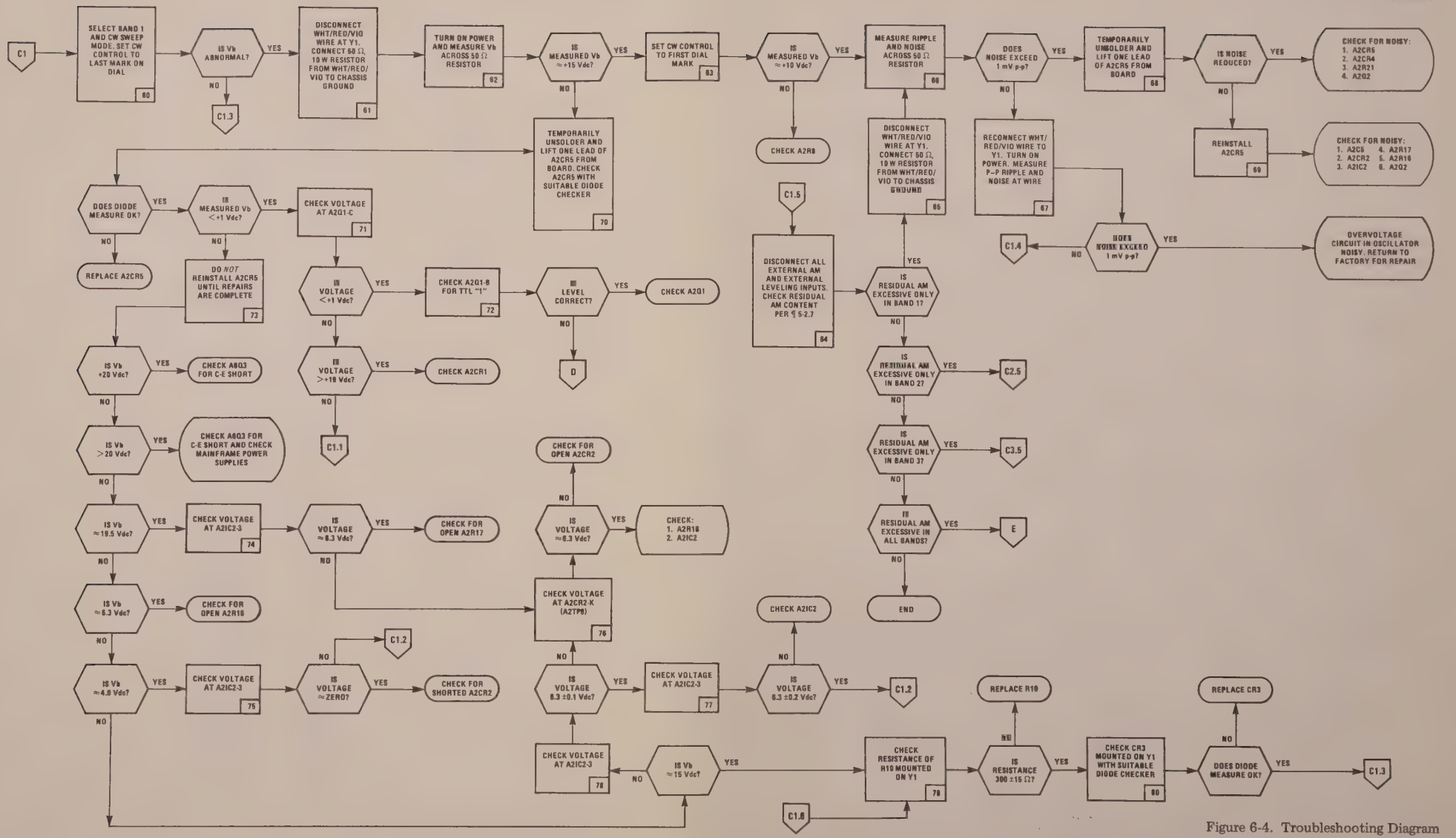


Figure 6-4. Troubleshooting Diagram
Sheet 5

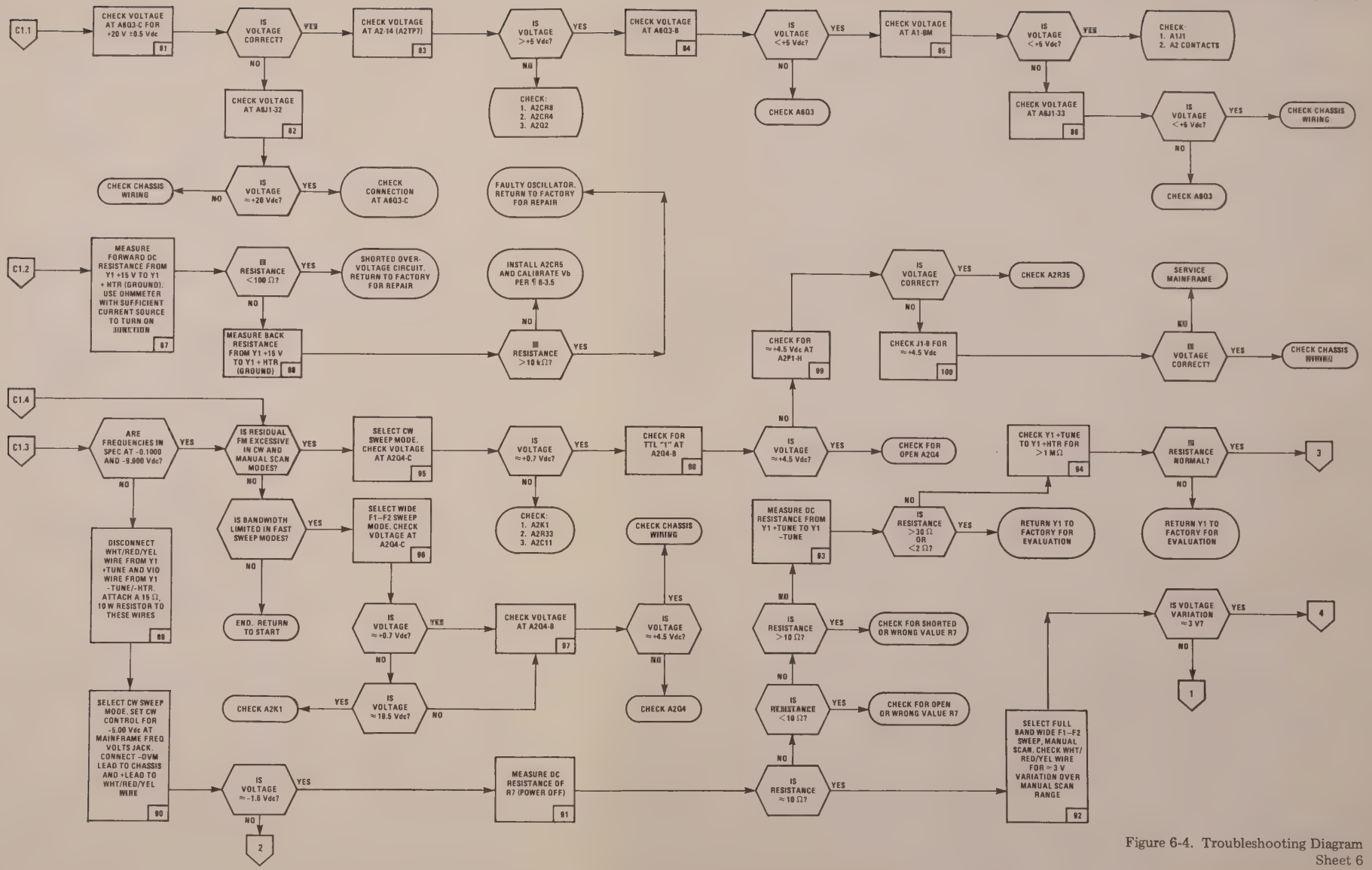


Figure 6-4. Troubleshooting Diagram
Sheet 6

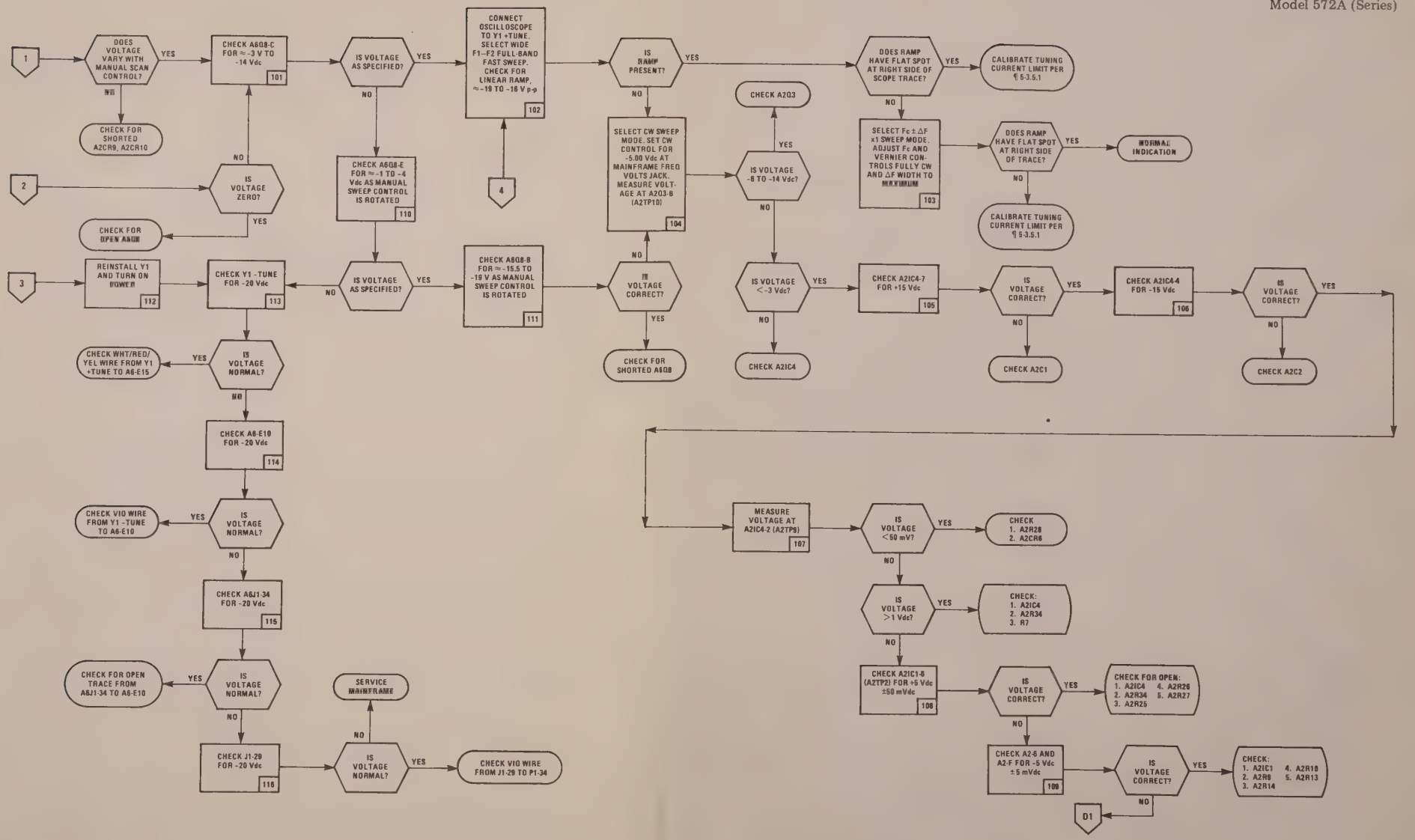


Figure 6-4. Troubleshooting Diagram
Sheet 7

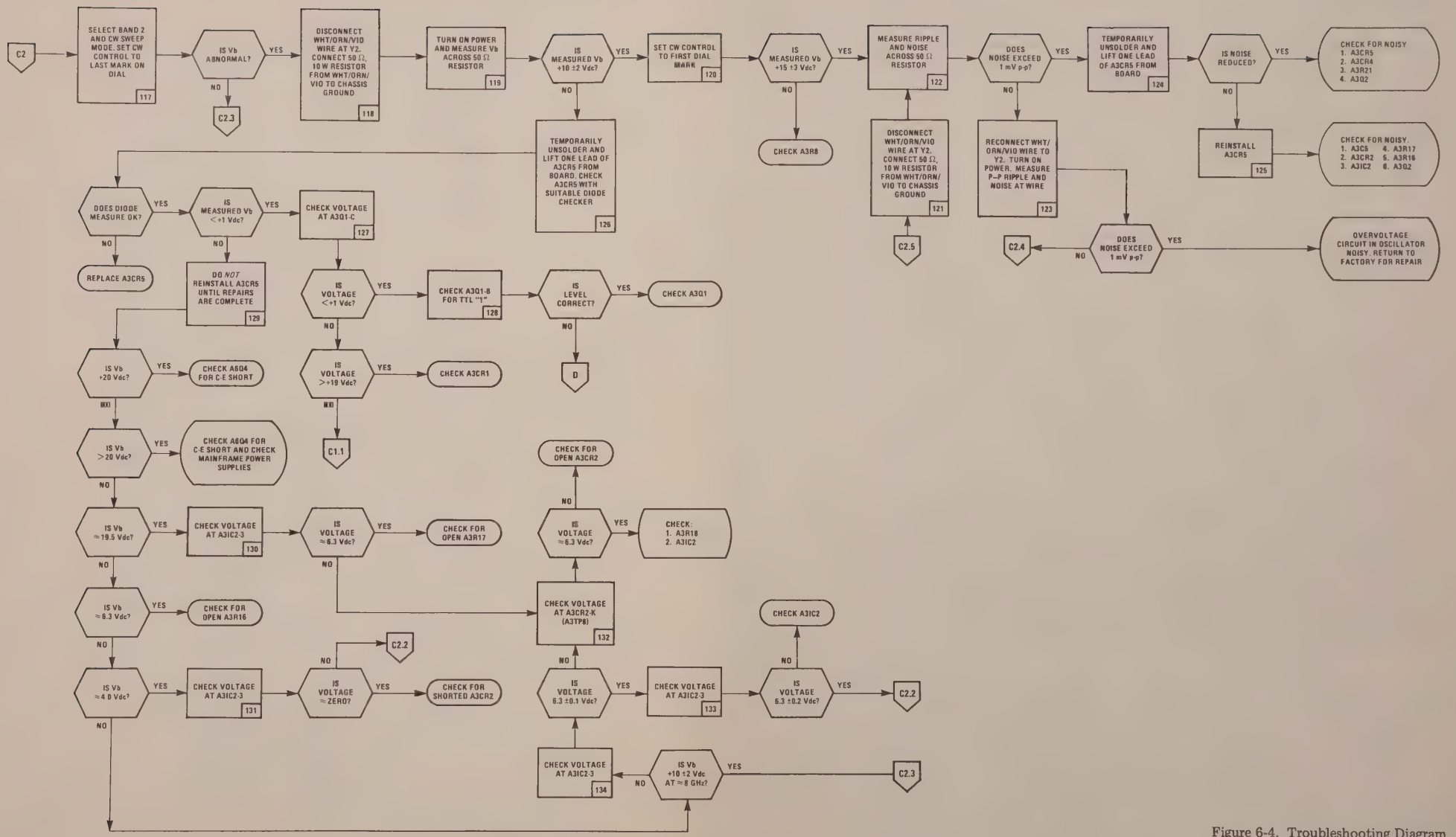


Figure 6-4. Troubleshooting Diagram
Sheet 8

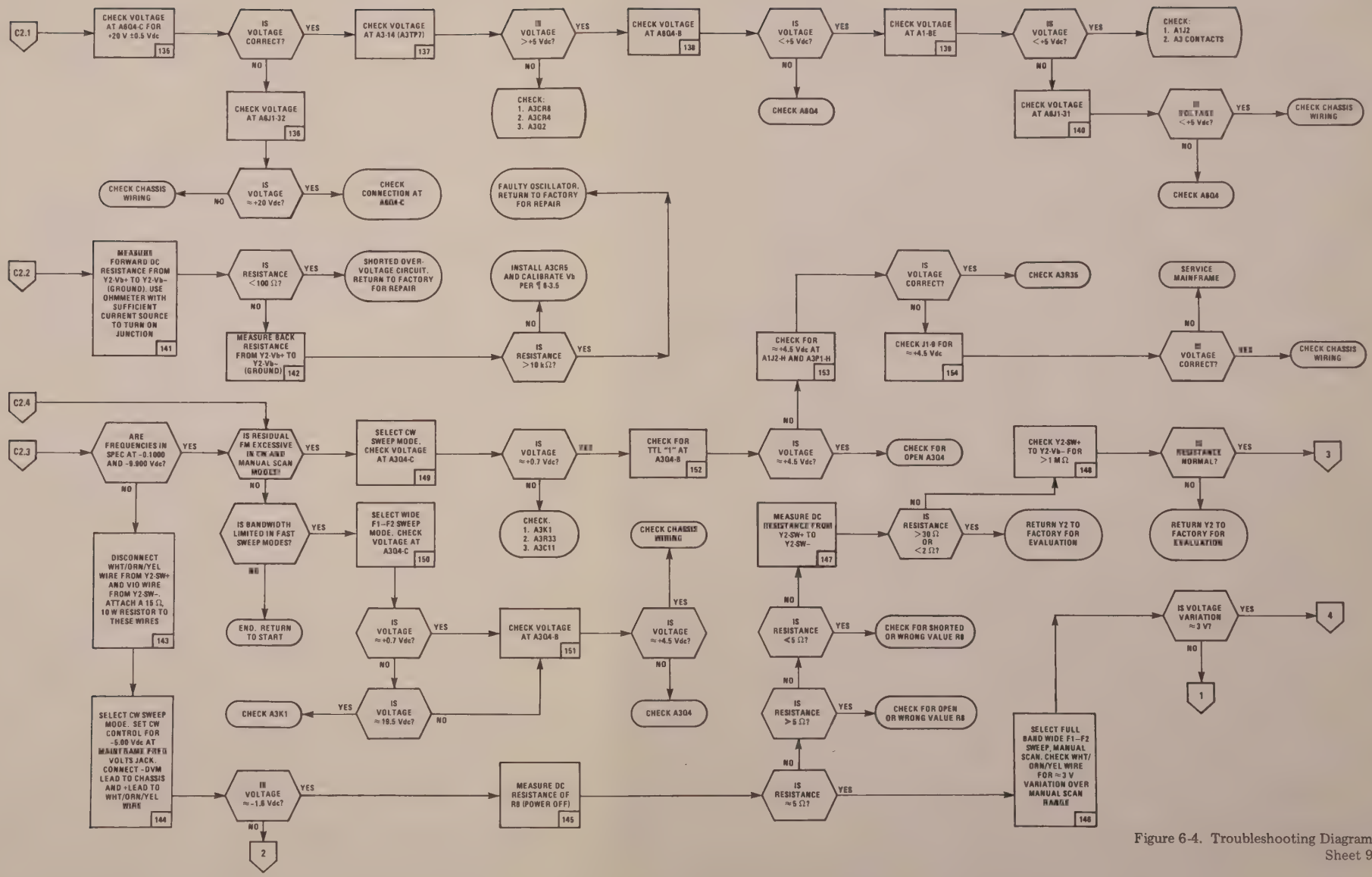


Figure 6-4. Troubleshooting Diagram
Sheet 9

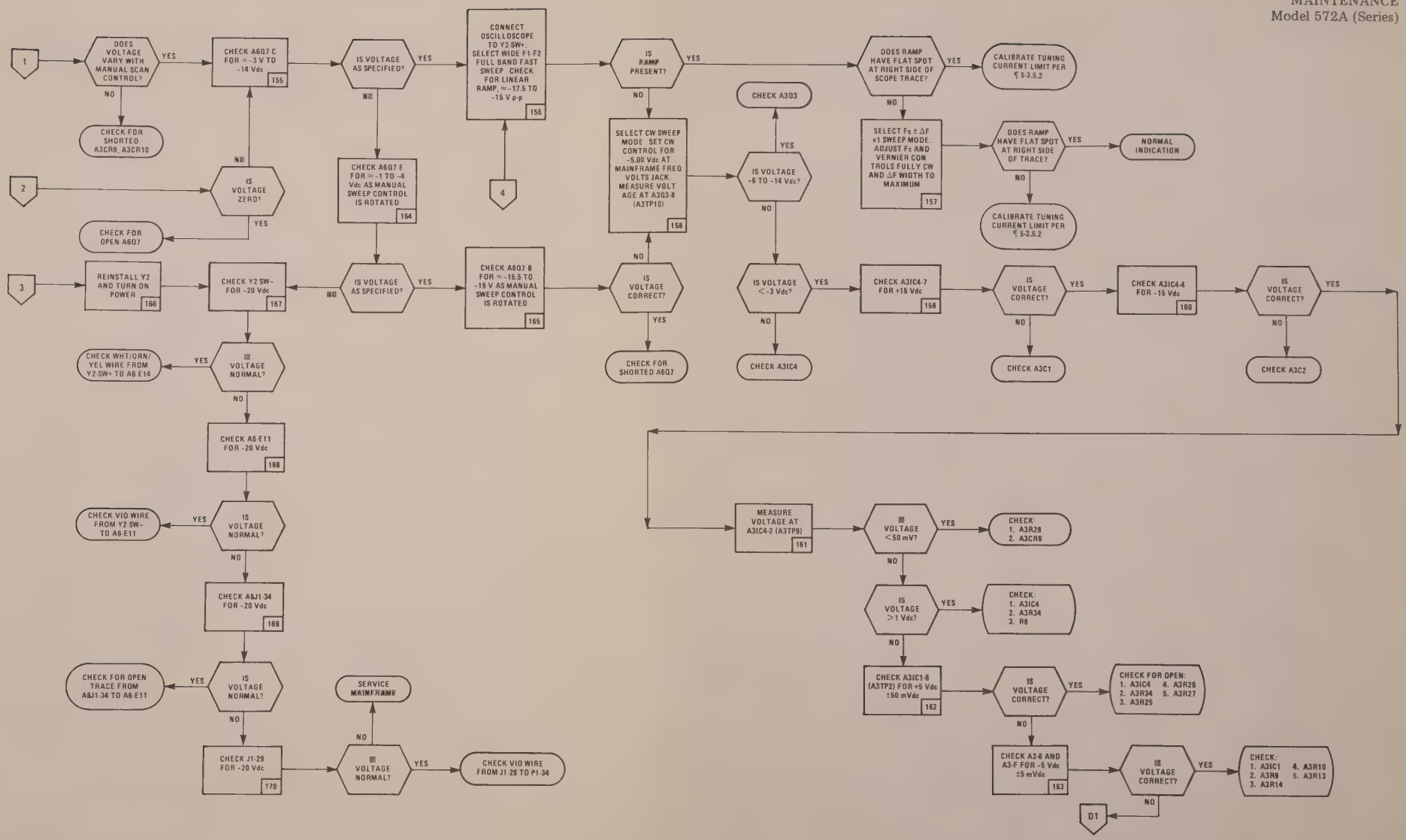


Figure 6-4. Troubleshooting Diagram
Sheet 10

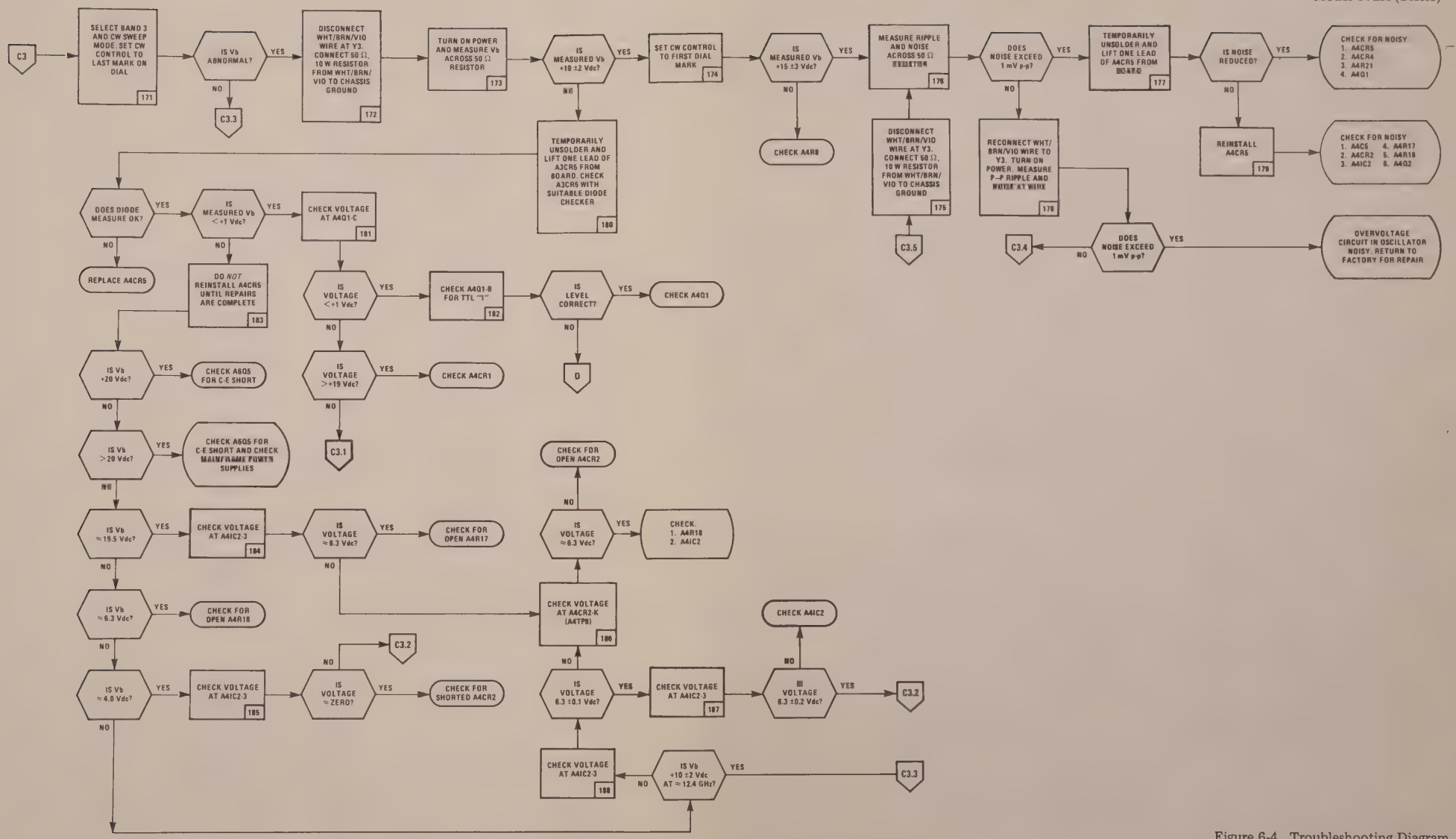


Figure 6-4. Troubleshooting Diagram
Sheet 11

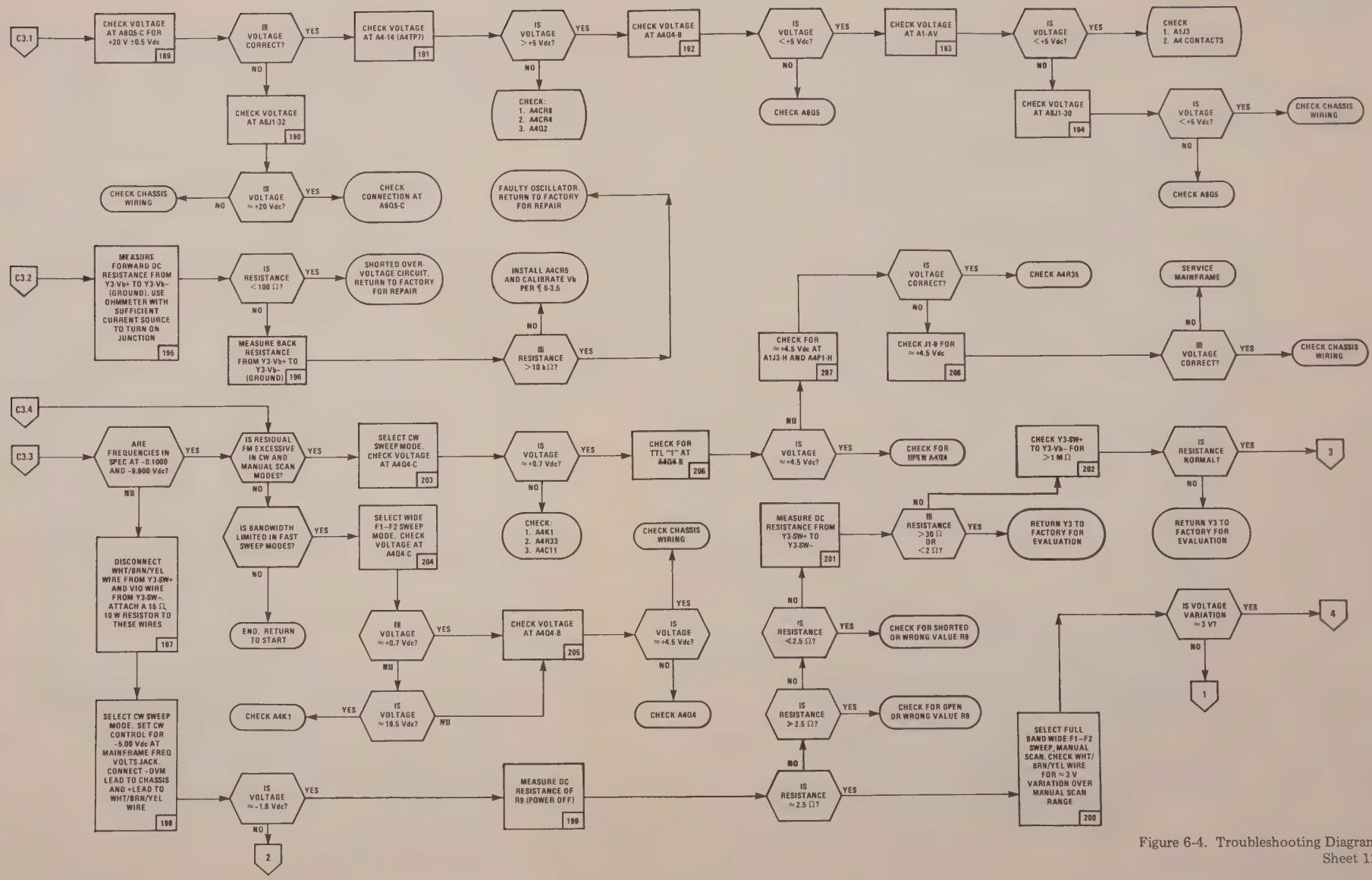


Figure 6-4. Troubleshooting Diagram
Sheet 12

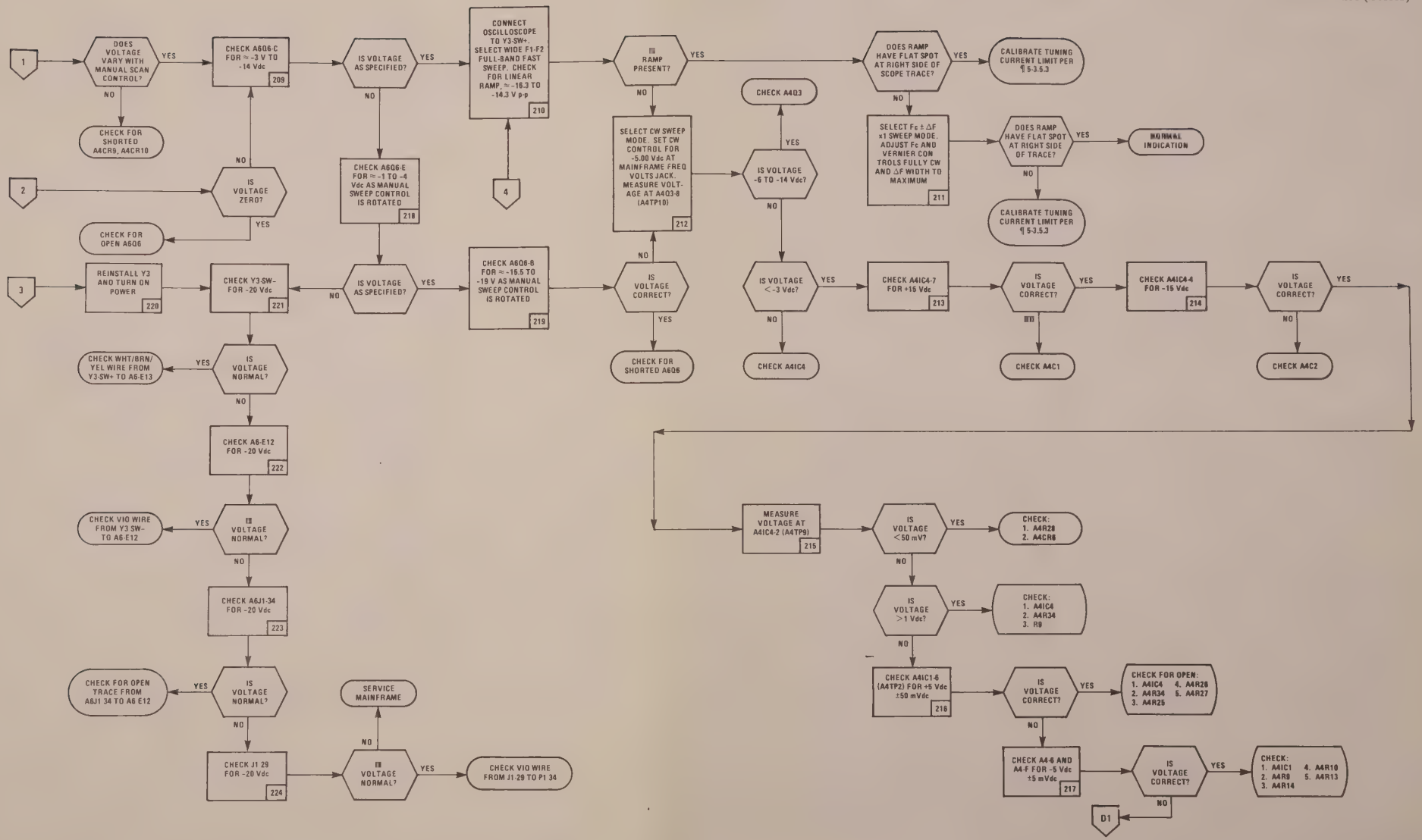


Figure 6-4. Troubleshooting Diagram
Sheet 13

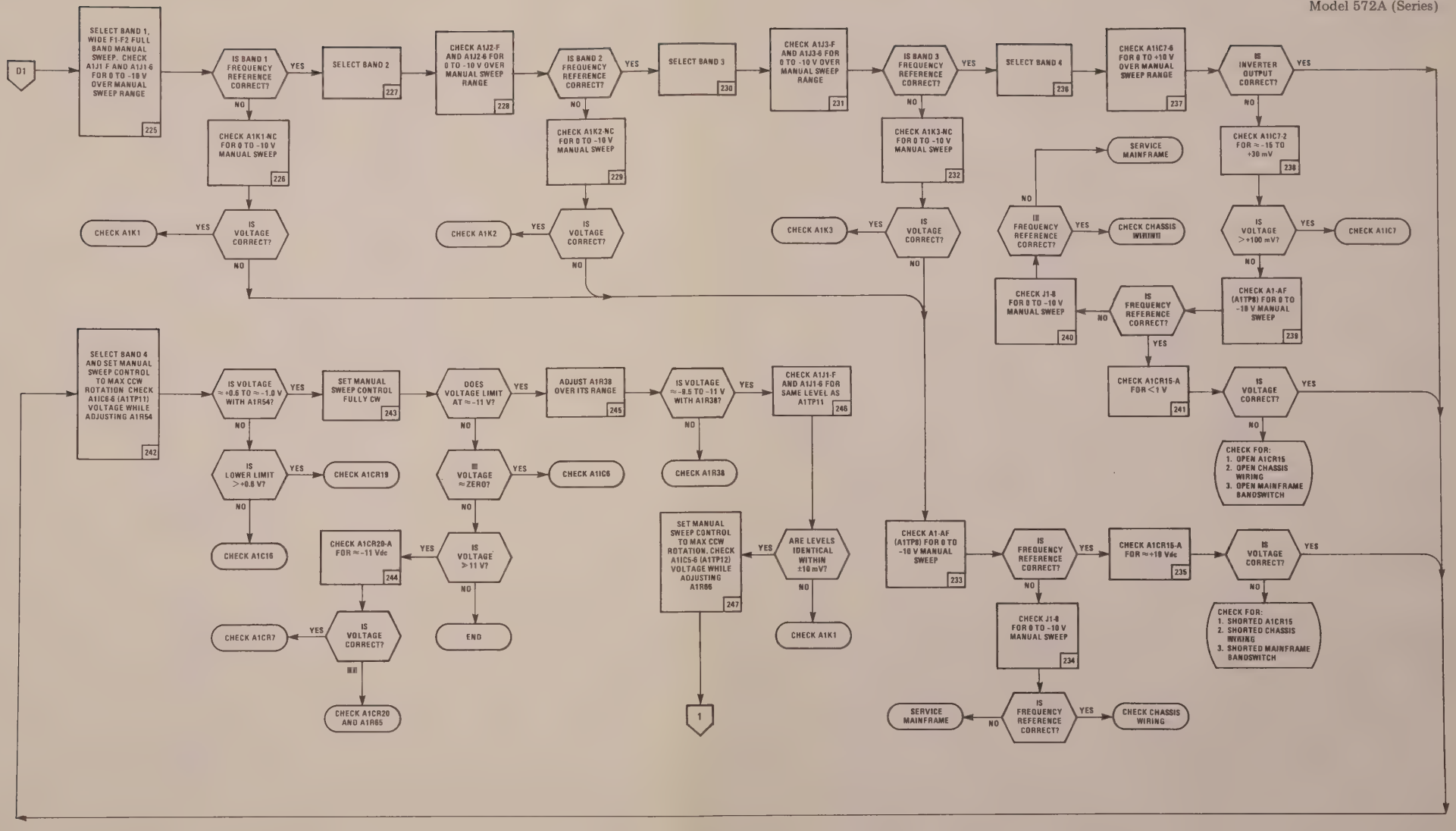

D1
SELECT BAND 1, WIDE F1-F2 FULL BAND MANUAL SWEEP. CHECK A1J1 F AND A1J1 6 FOR 0 TO -10 V OVER MANUAL SWEEP RANGE 225
IS BAND 1 FREQUENCY REFERENCE CORRECT?
YES
NO
SELECT BAND 2 227
CHECK A1J2-F AND A1J2-6 FOR 0 TO -10 V OVER MANUAL SWEEP RANGE 228
IS BAND 2 FREQUENCY REFERENCE CORRECT?
SELECT BAND 3 230
CHECK A1J3-F AND A1J3-6 FOR 0 TO -10 V OVER MANUAL SWEEP RANGE 231
IS BAND 3 FREQUENCY REFERENCE CORRECT?
SELECT BAND 4 236
CHECK A1C7-6 FOR 0 TO +10 V OVER MANUAL SWEEP RANGE 237
IS INVERTER OUTPUT CORRECT?
CHECK A1K1-NC FOR 0 TO -10 V MANUAL SWEEP 226
CHECK A1K2-NC FOR 0 TO -10 V MANUAL SWEEP 229
CHECK A1K3-NC FOR 0 TO -10 V MANUAL SWEEP 232
CHECK A1C7-2 FOR ≈ -15 TO +30 mV 238
SERVICE MAINFRAME
CHECK A1K1
IS VOLTAGE CORRECT?
CHECK A1K2
CHECK A1K3
FREQUENCY REFERENCE CORRECT?
CHECK CHASSIS WIRING
IS VOLTAGE >+100 mV?
CHECK A1C7
CHECK J1-8 FOR 0 TO -10 V MANUAL SWEEP 240
IS FREQUENCY REFERENCE CORRECT?
CHECK A1-AF (A1TP9) FOR 0 TO -10 V MANUAL SWEEP 239
SELECT BAND 4 AND SET MANUAL SWEEP CONTROL TO MAX CCW ROTATION. CHECK A1IC6-6 (A1TP11) VOLTAGE WHILE ADJUSTING A1R54 242
IS VOLTAGE ≈ +0.6 TO ≈ -1.0 V WITH A1R54?
SET MANUAL SWEEP CONTROL FULLY CW 243
DOES VOLTAGE LIMIT AT ≈ -11 V?
ADJUST A1R38 OVER ITS RANGE 245
IS VOLTAGE ≈ -8.5 TO -11 V WITH A1R38?
CHECK A1J1-F AND A1J1-6 FOR SAME LEVEL AS A1TP11 246
CHECK A1CR15-A FOR <1 V 241
IS VOLTAGE CORRECT?
CHECK FOR:
1. OPEN A1CR15
2. OPEN CHASSIS WIRING
3. OPEN MAINFRAME BANDSWITCH
IS LOWER LIMIT >+0.8 V?
CHECK A1CR19
VOLTAGE ≈ ZERO?
CHECK A1C6
CHECK A1R38
SET MANUAL SWEEP CONTROL TO MAX CCW ROTATION. CHECK A1IC5-6 (A1TP12) VOLTAGE WHILE ADJUSTING A1R66 247
ARE LEVELS IDENTICAL WITHIN ±10 mV?
CHECK A1C16
CHECK A1CR20-A FOR ≈ -11 Vdc 244
IS VOLTAGE >11 V?
CHECK A1K1
CHECK A1CR7
IS VOLTAGE CORRECT?
END
CHECK A1CR20 AND A1R65
1
CHECK A1-AF (A1TP8) FOR 0 TO -10 V MANUAL SWEEP 233
IS FREQUENCY REFERENCE CORRECT?
CHECK A1CR15-A FOR ≈ +10 Vdc 235
IS VOLTAGE CORRECT?
CHECK FOR:
1. SHORTED A1CR15
2. SHORTED CHASSIS WIRING
3. SHORTED MAINFRAME BANDSWITCH
CHECK J1-8 FOR 0 TO -10 V MANUAL SWEEP 234
SERVICE MAINFRAME
IS FREQUENCY REFERENCE CORRECT?
CHECK CHASSIS WIRING

Figure 6-4. Troubleshooting Diagram
Sheet 14

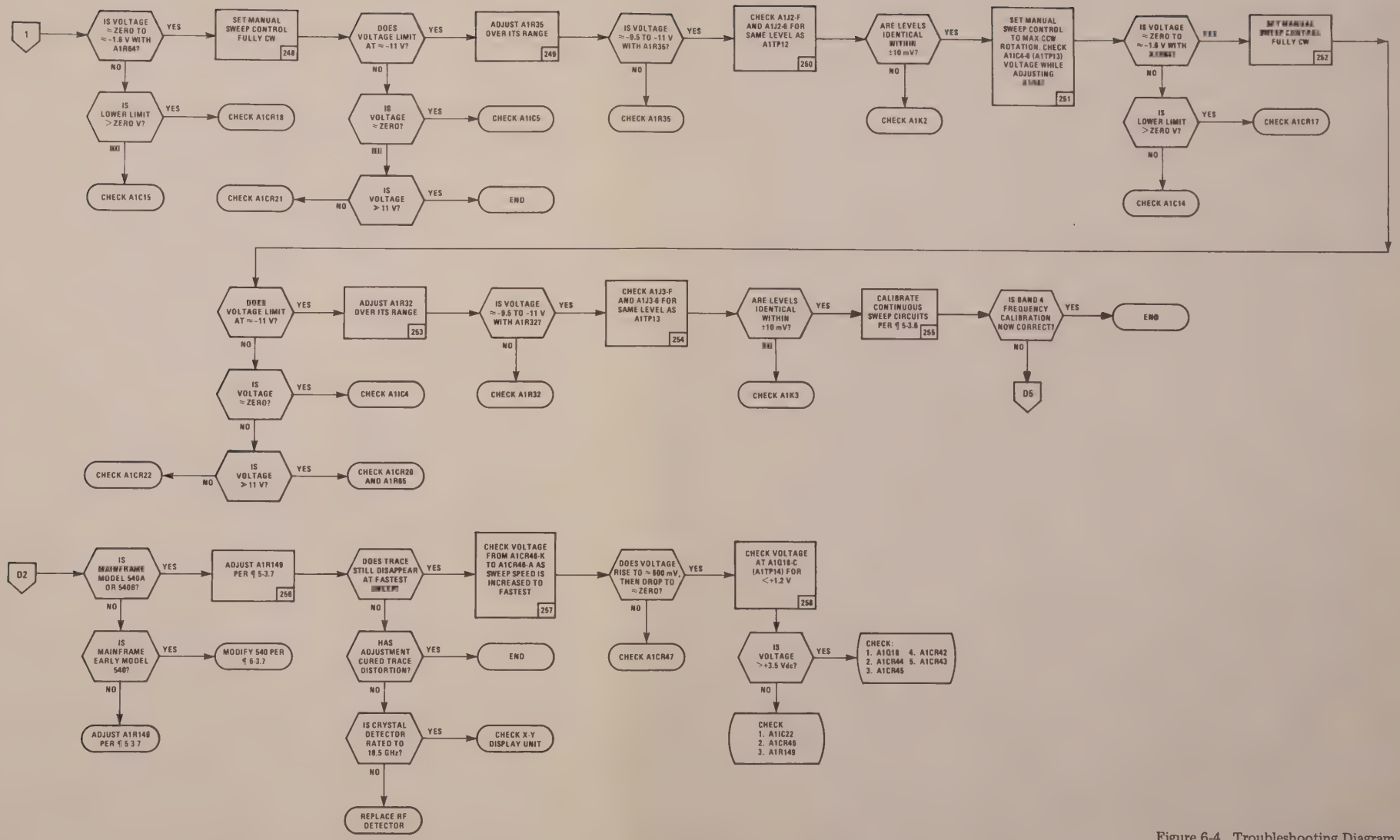


Figure 6-4. Troubleshooting Diagram
Sheet 15

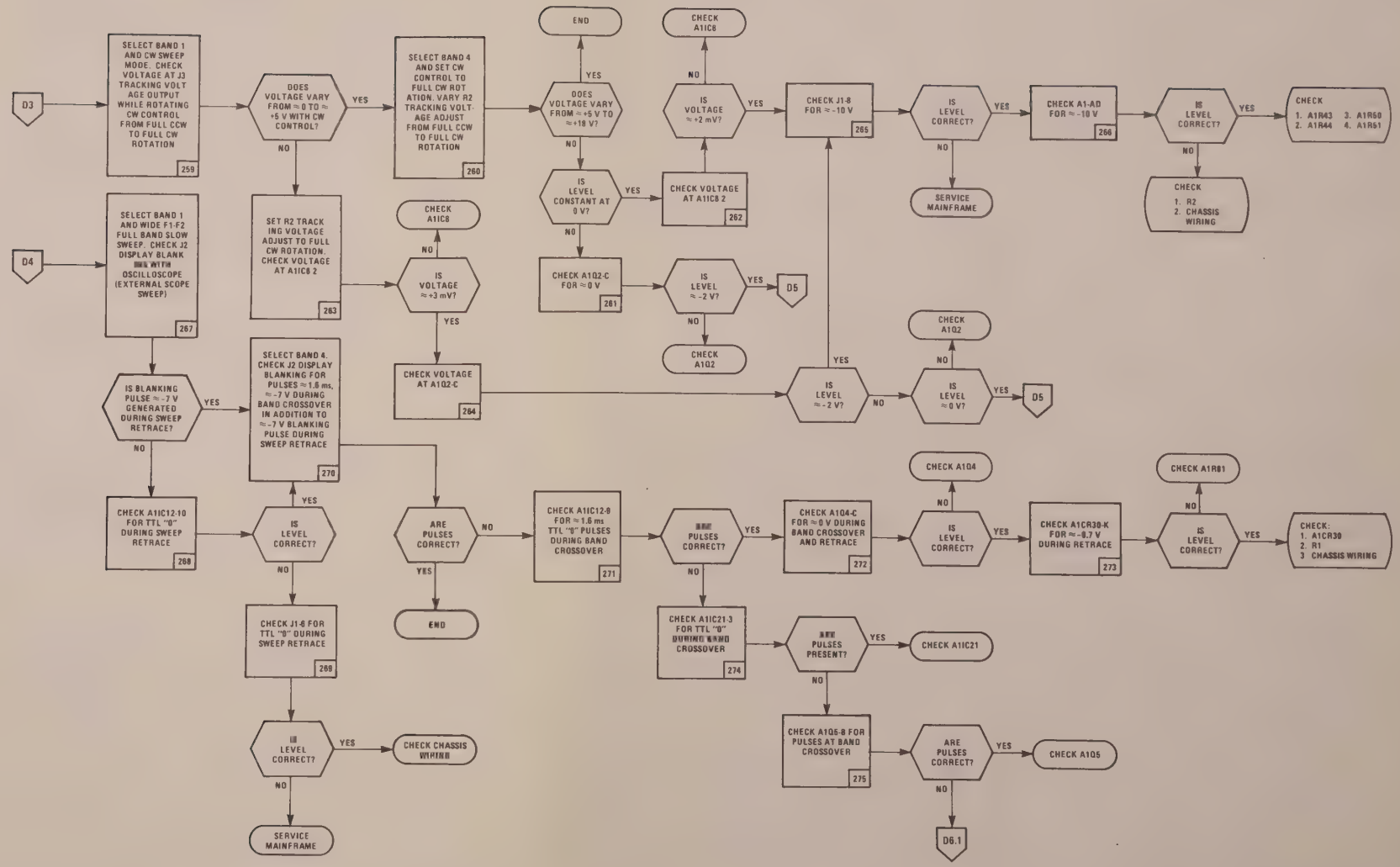

D3
SELECT BAND 1 AND CW SWEEP MODE. CHECK VOLTAGE AT J3 TRACKING VOLTAGE OUTPUT WHILE ROTATING CW CONTROL FROM FULL CCW TO FULL CW ROTATION
259
DOES VOLTAGE VARY FROM ≈ 0 TO ≈ +5 V WITH CW CONTROL?
YES
NO
SELECT BAND 4 AND SET CW CONTROL TO FULL CW ROTATION. VARY R2 TRACKING VOLTAGE ADJUST FROM FULL CCW TO FULL CW ROTATION
260
DOES VOLTAGE VARY FROM ≈ +5 V TO ≈ +18 V?
END
IS LEVEL CONSTANT AT 0 V?
CHECK VOLTAGE AT A11C8 2
262
CHECK A11C8
IS VOLTAGE ≈ +2 mV?
CHECK J1-8 FOR ≈ -10 V
265
IS LEVEL CORRECT?
SERVICE MAINFRAME
CHECK A1-AD FOR ≈ -10 V
266
CHECK
1. A1R43 3. A1R50
2. A1R44 4. A1R51
CHECK
1. R2
2. CHASSIS WIRING
D4
SELECT BAND 1 AND WIDE F1-F2 FULL BAND SLOW SWEEP. CHECK J2 DISPLAY BLANK [illegible] WITH OSCILLOSCOPE (EXTERNAL SCOPE SWEEP)
267
SET R2 TRACKING VOLTAGE ADJUST TO FULL CW ROTATION. CHECK VOLTAGE AT A11C8 2
263
CHECK A11C8
IS VOLTAGE ≈ +3 mV?
CHECK VOLTAGE AT A1Q2-C
264
CHECK A1Q2-C FOR ≈ 0 V
261
IS LEVEL ≈ -2 V?
D5
CHECK A1Q2
IS LEVEL ≈ -2 V?
IS LEVEL ≈ 0 V?
IS BLANKING PULSE ≈ -7 V GENERATED DURING SWEEP RETRACE?
SELECT BAND 4. CHECK J2 DISPLAY BLANKING FOR PULSES ≈ 1.6 ms, ≈ -7 V DURING BAND CROSSOVER IN ADDITION TO ≈ -7 V BLANKING PULSE DURING SWEEP RETRACE
270
CHECK A11C12-10 FOR TTL "0" DURING SWEEP RETRACE
268
IS LEVEL CORRECT?
CHECK J1-8 FOR TTL "0" DURING SWEEP RETRACE
269
IS LEVEL CORRECT?
CHECK CHASSIS WIRING
SERVICE MAINFRAME
ARE PULSES CORRECT?
END
CHECK A11C12-9 FOR ≈ 1.6 ms TTL "0" PULSES DURING BAND CROSSOVER
271
[illegible] PULSES CORRECT?
CHECK A1Q4-C FOR ≈ 0 V DURING BAND CROSSOVER AND RETRACE
272
CHECK A1Q4
IS LEVEL CORRECT?
CHECK A1CR30-K FOR ≈ -0.7 V DURING RETRACE
273
CHECK A1R81
IS LEVEL CORRECT?
CHECK:
1. A1CR30
2. R1
3 CHASSIS WIRING
CHECK A11C21-3 FOR TTL "0" DURING BAND CROSSOVER
274
[illegible] PULSES PRESENT?
CHECK A11C21
CHECK A1Q5-8 FOR PULSES AT BAND CROSSOVER
275
ARE PULSES CORRECT?
CHECK A1Q5
D6.1

Figure 6-4. Troubleshooting Diagram
Sheet 16

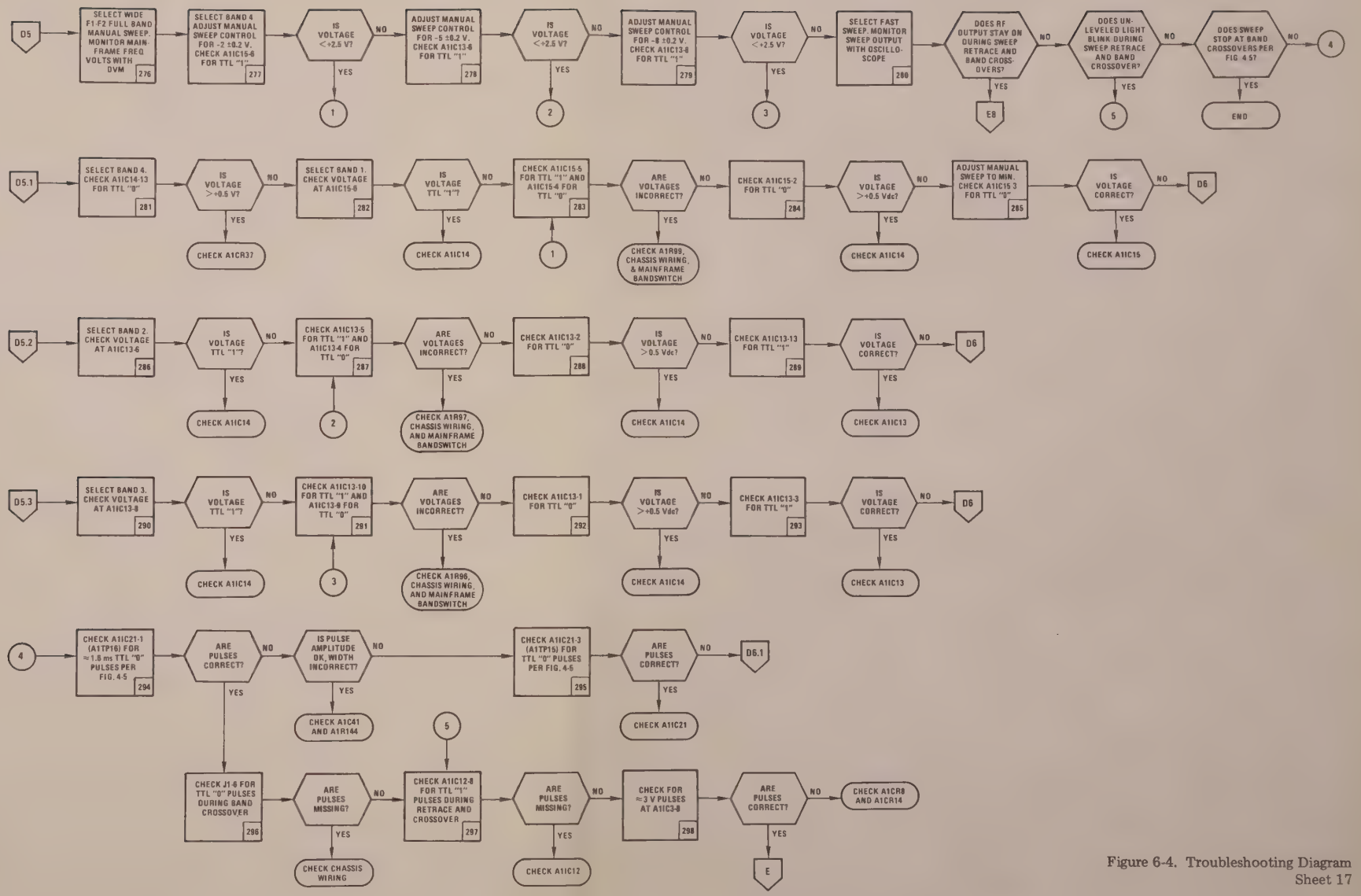


Figure 6-4. Troubleshooting Diagram
Sheet 17

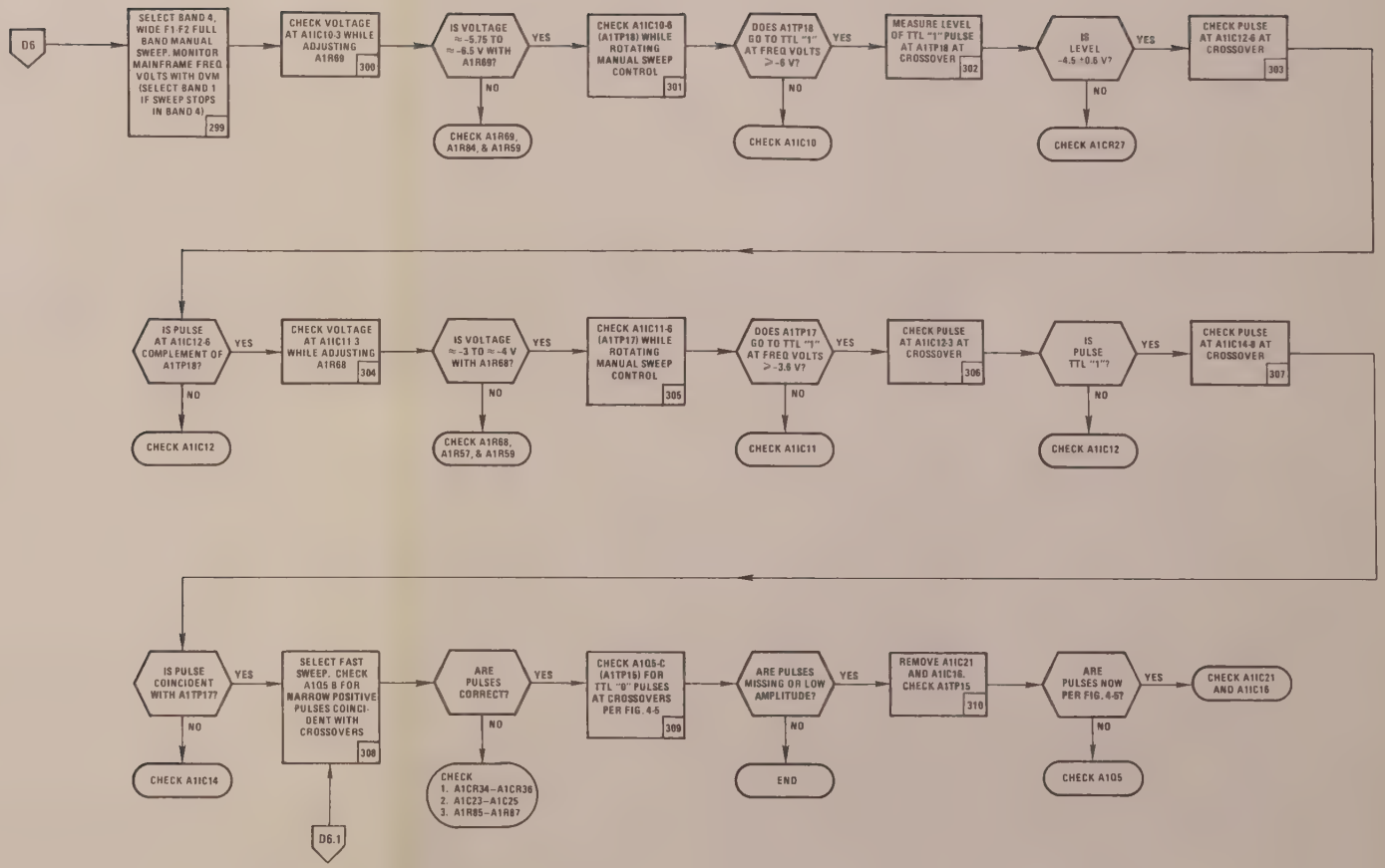

D6
SELECT BAND 4, WIDE F1 F2 FULL BAND MANUAL SWEEP. MONITOR MAINFRAME FREQ VOLTS WITH DVM (SELECT BAND 1 IF SWEEP STOPS IN BAND 4) 299
CHECK VOLTAGE AT A1IC10-3 WHILE ADJUSTING A1R69 300
IS VOLTAGE ≈ -5.75 TO ≈ -6.5 V WITH A1R69?
YES
NO
CHECK A1R69, A1R84, & A1R59
CHECK A1IC10-8 (A1TP18) WHILE ROTATING MANUAL SWEEP CONTROL 301
DOES A1TP18 GO TO TTL "1" AT FREQ VOLTS > -6 V?
YES
NO
CHECK A1IC10
MEASURE LEVEL OF TTL "1" PULSE AT A1TP18 AT CROSSOVER 302
IS LEVEL -4.5 ±0.6 V?
YES
NO
CHECK A1CR27
CHECK PULSE AT A1IC12-6 AT CROSSOVER 303
IS PULSE AT A1IC12-6 COMPLEMENT OF A1TP18?
YES
NO
CHECK A1IC12
CHECK VOLTAGE AT A1IC11 3 WHILE ADJUSTING A1R68 304
IS VOLTAGE ≈ -3 TO ≈ -4 V WITH A1R68?
YES
NO
CHECK A1R68, A1R57, & A1R59
CHECK A1IC11-6 (A1TP17) WHILE ROTATING MANUAL SWEEP CONTROL 305
DOES A1TP17 GO TO TTL "1" AT FREQ VOLTS > -3.6 V?
YES
NO
CHECK A1IC11
CHECK PULSE AT A1IC12-3 AT CROSSOVER 306
IS PULSE TTL "1"?
YES
NO
CHECK A1IC12
CHECK PULSE AT A1IC14-8 AT CROSSOVER 307
IS PULSE COINCIDENT WITH A1TP17?
YES
NO
CHECK A1IC14
SELECT FAST SWEEP. CHECK A1Q5 B FOR NARROW POSITIVE PULSES COINCIDENT WITH CROSSOVERS 308
D6.1
ARE PULSES CORRECT?
YES
NO
CHECK
1. A1CR34–A1CR36
2. A1C23–A1C25
3. A1R85–A1R87
CHECK A1Q5-C (A1TP15) FOR TTL "0" PULSES AT CROSSOVERS PER FIG. 4-5 309
ARE PULSES MISSING OR LOW AMPLITUDE?
YES
NO
END
REMOVE A1IC21 AND A1IC16. CHECK A1TP15 310
ARE PULSES NOW PER FIG. 4-5?
YES
NO
CHECK A1Q5
CHECK A1IC21 AND A1IC16

Figure 6-4: Troubleshooting Diagram
Sheet 18

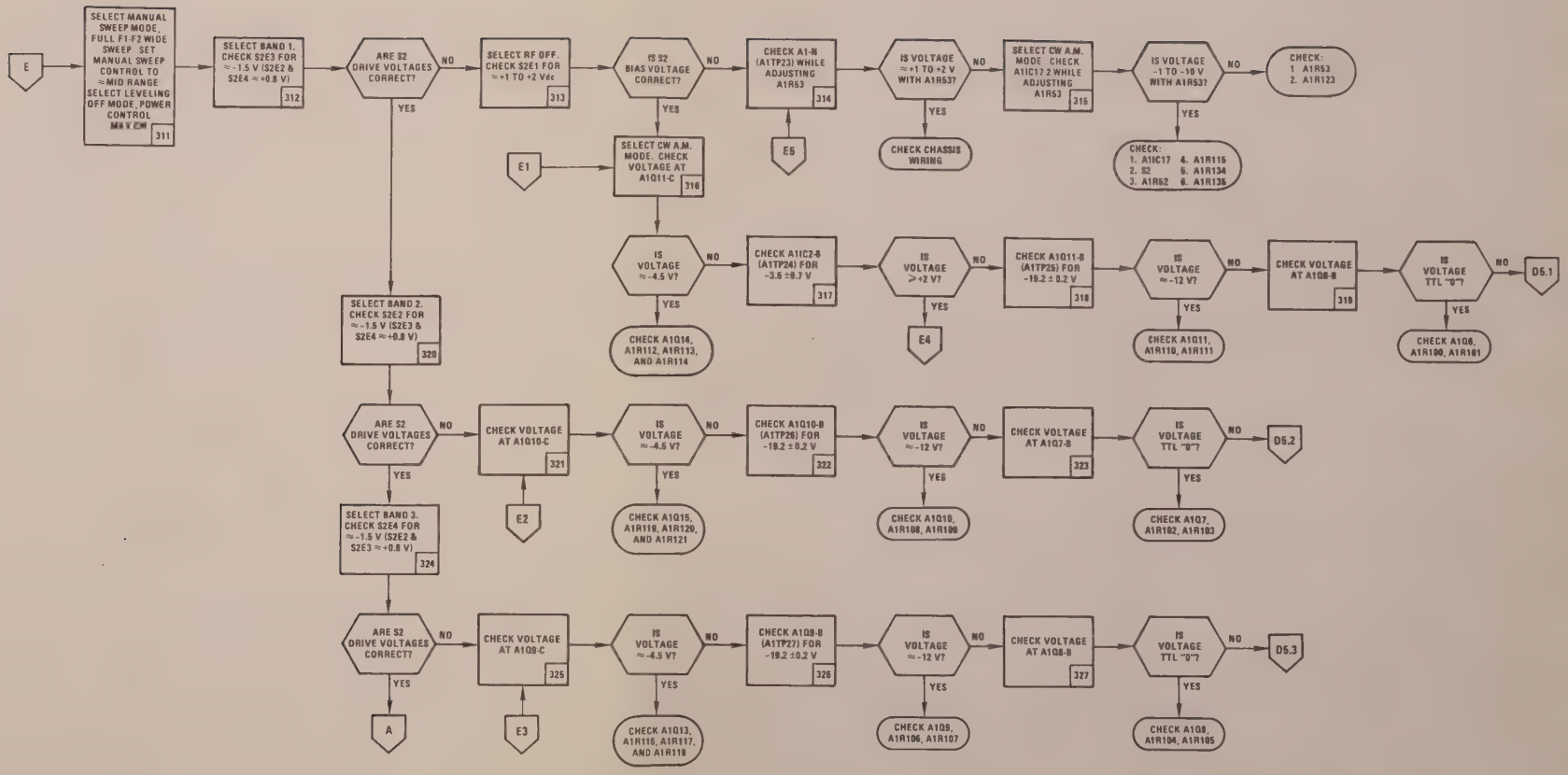


Figure 6-4. Troubleshooting Diagram
Sheet 19

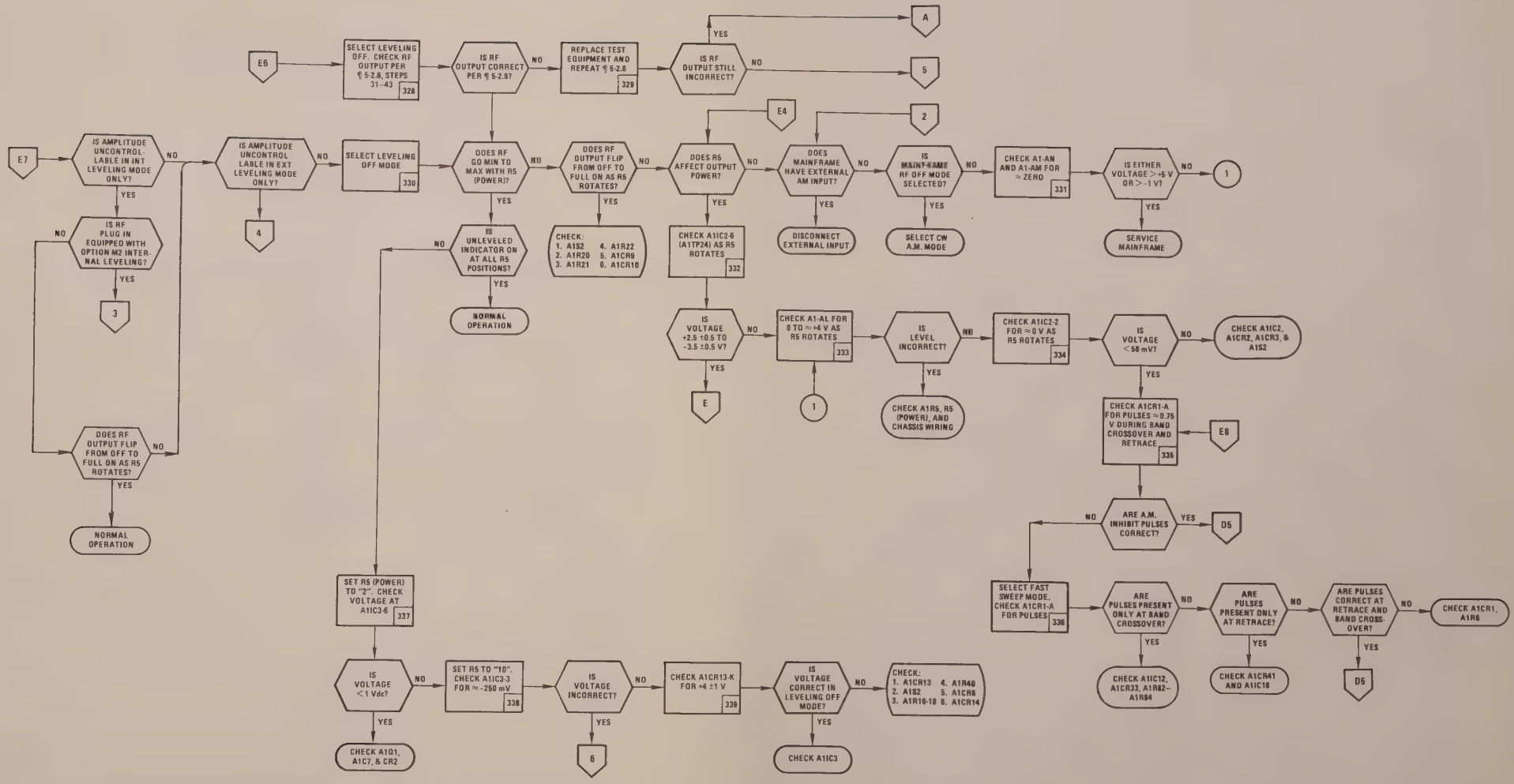


Figure 6-4. Troubleshooting Diagram
Sheet 20

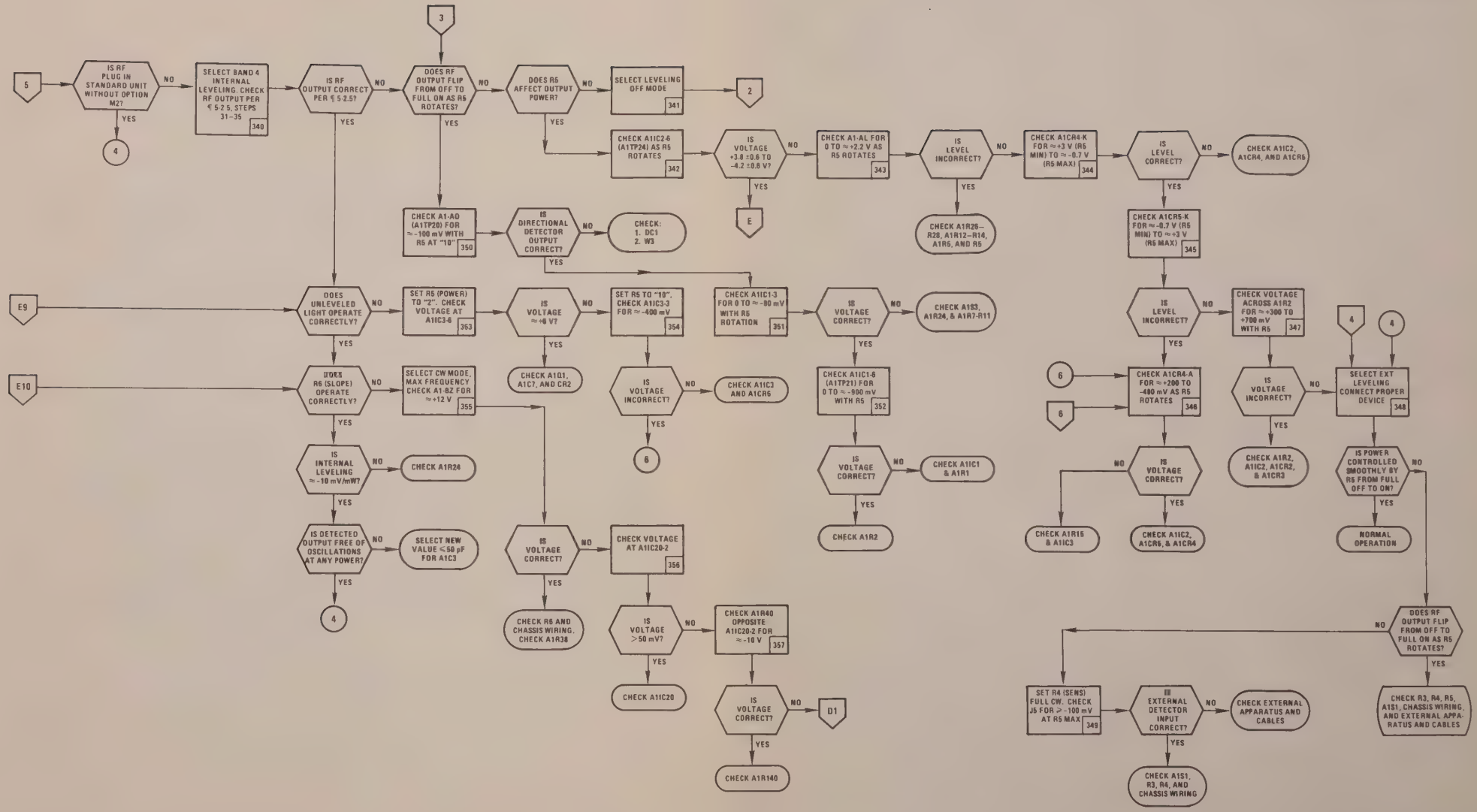


Figure 6-4. Troubleshooting Diagram
Sheet 21

SECTION VII

REPLACEABLE PARTS LISTS

7-1. INTRODUCTION

This section contains replaceable parts lists for the Model 572A-17 Multiband RF Plug-in Unit.

7-2. REPLACEMENT PARTS

The majority of the electronic parts used in the plug-in are standard distributor items, and should be available locally. To order special replacement parts and parts which are not otherwise obtainable, write to Systron-Donner Corporation at the address shown at the front of this manual, contact your local Systron-Donner Service Center, or contact your local Scientific Devices office.

Be sure to include the model number (572A-17) and serial number of the unit for which parts are required. Please order by Systron-Donner part number; also include the reference designator where applicable.

7-3. EXPLANATION OF COLUMNS

FIG. NO. This column references the figure number in which the part can be located.

REFERENCE DESIGNATION. Parts are listed in sequence by reference designation and may be located on the schematic diagram or other referenced figure by this designator.

SYSTRON-DONNER PART NUMBER. All standard parts manufactured by Systron-Donner or manufactured to Systron-Donner specifications are listed in this column, but not in the MFR'S PART NUMBER column. All other purchased parts which have been assigned Systron-Donner part numbers are also listed in this column. These part numbers must be used when ordering parts.

MFR'S PART NUMBER. Commercially-available parts not manufactured by Systron-Donner or to Systron-Donner specifications are listed in this column. Insofar as possible, these part numbers are complete. For best results, always include a complete part description as well as the listed manufacturer's part number when ordering replacement parts from manufacturers or distributors.

MFR. The five-digit Federal Manufacturers Codes, as listed in Cataloging Handbooks H4-1 and H4-2, are listed in this column. These codes and corresponding manufacturers are listed in Paragraph 7-4.

DESCRIPTION. Descriptions of component parts of subassemblies are indented to indicate the parts comprising each subassembly.

7-4. MANUFACTURERS' CODES

CODE	NAME
00779	AMP Special Industries Division of AMP, Inc. Valley Forge, PA
01121	Allen Bradley Co. Milwaukee, WI
01220	Systron-Donner Corporation Microwave Division Van Nuys, CA
01295	Texas Instruments, Inc. Van Nuys, CA
01686	RCL Electronics Manchester, NH
03494	General Electric Co. Schenectady, NY
04713	Motorola, Inc. Semiconductor Products Division Phoenix, AZ
05041	Masterite Industries, Inc. Torrance, CA
05464	Industrial Electronic Engineers, Inc. Van Nuys, CA
06383	Panduit Corp. Tinley Park, IL
07263	Fairchild Semiconductor Mountain View, CA
08547	R. G. Wallace Co., Inc. Palo Alto, CA
09026	Babcock Electronics Corp. Control Products Division Costa Mesa, CA
12954	Siemens Corporation (formerly Dickson) Components Group Scottsdale, AZ
12969	Unitrode Corporation Watertown, MA
13047	Maury Microwave Cucamonga, CA
16179	Omni-Spectra, Inc. OSM Division Merrimack, NH

CODE	NAME
16428	Belden Corporation Electronic Division Richmond, IN
16453	Western Microwave Labs, Inc. Los Gatos, CA
17540	Alpha Industries Woburn, MA
18714	RCA Solid State Division Findlay, OH
24539	Avantek Santa Clara, CA
24546	Corning Glass Works Bradford, PA
26805	Americon Microwave Industries, Inc. Waltham, MA
27014	National Semiconductor Corporation Santa Clara, CA
27264	Molex Products Co. Downers Grove, IL
29083	Monsanto St. Peters, MO
29111	Systron-Donner Corporation Advanced Components Division Sunnyvale, CA
29577	AVX Ceramics Division of AVX Corporation Myrtle Beach, SC
31918	International Electro Exchange, Inc. Eden Prairie, MN
52136	Rystal Electronics Corporation N. Miami Beach, FL
52542	Systron-Donner Corporation Concord Instrument Division Concord, CA
53720	Aercom Sunnyvale, CA
56289	Sprague Products Co. North Adams, MA
63743	Ward Leonard Elec. Co., Inc. Subsidiary of Unimax Group, Inc. Mt. Vernon, NY
71002	Birnbach Co., Inc. Freeport, NY

CODE	NAME
71590	Centralab Electronics Division of Globe-Union, Inc. Milwaukee, WI
72136	Electro Motive Mfg. Co., Inc. Willimantic, CT
72982	Erie Technological Products, Inc. Erie, PA
75042	TRW, Inc. Philadelphia Division Philadelphia, PA
78488	Stackpole Components Co. Raleigh, NC
83330	Herman H. Smith Co., Inc. Brooklyn, NY
86797	Rogan Corporation Northbrook, IL
88245	Litton Systems, Inc. Useco Division Van Nuys, CA 91409
89709	Bunker-Ramo Corporation Connector Division Broadview, IL
90201	Mallory Capacitor Co. Division of P.R. Mallory Indianapolis, IN
91418	Radio Materials Co. Division of P.R. Mallory Chicago, IL
91637	Dale Electronics, Inc. Columbus, NB
91836	Kings Electronics Co. Tuckahoe, NY
93306	Uniform Tubes Micro Delay Division Collegeville, PA
94222	Southco Lester, PA
98978	International Electronic Research Corp. Burbank, CA
99313	Varian Corporation Palo Alto, CA

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
8-3	A1	94625002		01220	BOARD ASSY--MOTHER BOARD Consisting of:
	A1C1	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C2	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C3	100253	DM15ED100J0	72136	CAPACITOR, Mica, 10 pF ±5%, 500 V
	A1C4	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C5	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C6	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C7	107041	196D106X9020JA1	56289	CAPACITOR, Tantalum, 10 μF ±20%, 20 V
	A1C8	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C9	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C10	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C11	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C12	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C13	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C14	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C15	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C16	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C17	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C18	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C19	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C20	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C21				Not used
	A1C22				Not used
	A1C23	100173	DM15FD101J0	72136	CAPACITOR, Mica, 100 pF ±5%, 500 V
	A1C24	100173	DM15FD101J0	72136	CAPACITOR, Mica, 100 pF ±5%, 500 V
	A1C25	100173	DM15FD101J0	72136	CAPACITOR, Mica, 100 pF ±5%, 500 V
	A1C26	107136	8121-100-651-473M	72982	CAPACITOR, Ceramic, .047 μF ±20%, 100 V
	A1C27	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C28	107041	196D106X9020JA1	56289	CAPACITOR, Tantalum, 10 μF ±20%, 20 V
	A1C29	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C30	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C31	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C32	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C33	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C34	107041	196D106X9020JA1	56289	CAPACITOR, Tantalum, 10 μF ±20%, 20 V
	A1C35	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C36	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A1C37				Not used
	A1C38				Not used
	A1C39	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C40	100103	TA110	91418	CAPACITOR, Ceramic, .01 μF +80, -20%, 100 V
	A1C41	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A1C42	104149	192P1049R8	56289	CAPACITOR, Mylar, 1 μF ±10%, 80 V
	A1C43	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A1C44	100276	DM15FD331J0	72136	CAPACITOR, Mica, 330 pF ±5%, 500 V
	A1CR1	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR2	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR3	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR4	105541	1N5228	04713	DIODE, Zener, 3.9 V ±10%, 1/2 W
	A1CR5	105541	1N5228	04713	DIODE, Zener, 3.9 V ±10%, 1/2 W
	A1CR6	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR7	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR8	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR9	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR10	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR11	105554	1N5230	04713	DIODE, Zener, 4.7 V ±10%, 1/2 W
	A1CR12				Not used
	A1CR13	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR14	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR15	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR16	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR17	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR18	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR19	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR20	105575	1N5241B	04713	DIODE, Zener, 11 V ±5%, 1/2 W
	A1CR21	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR22	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR23	105532	1N4446	03494	DIODE, Silicon, 75 PIV

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	A1CR24	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR25	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR26	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR27	105541	1N5228	04713	DIODE, Zener, 3.9 V ±10%, 1/2 W
	A1CR28				Not used
	A1CR29				Not used
	A1CR30	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR31				Not used
	A1CR32	105583	1N5240	04713	DIODE, Zener, 10 V ±10%, 1/2 W
	A1CR33	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR34	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR35	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR36	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR37	105595	1N277	04713	DIODE, Germanium, 100 PIV
	A1CR38	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR39	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR40	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR41	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR42	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR43	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR44	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR45	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR46	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1CR47	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A1IC1	105609	LM318H	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC2	105609	LM318H	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC3	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC4	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC5	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC6	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC7	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC8	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC9				Not used
	A1IC10	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC11	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC12	019705	SN7400N	01295	INTEGRATED CIRCUIT, Quadruple 2-Input NAND Gate
	A1IC13	025707	SN7451N	01295	INTEGRATED CIRCUIT, AND-OR-Invert Gate
	A1IC14	025779	SN7404N	01295	INTEGRATED CIRCUIT, Hex Inverter
	A1IC15	025707	SN7451N	01295	INTEGRATED CIRCUIT, AND-OR-Invert Gate
	A1IC16	025760	SN74121N	01295	INTEGRATED CIRCUIT, One-Shot Multivibrator
	A1IC17	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC18	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC19	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC20	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1IC21	025760	SN74121N	01295	INTEGRATED CIRCUIT, One-Shot Multivibrator
	A1IC22	105609	LM318H	27014	INTEGRATED CIRCUIT, Operational Amplifier
	A1J1	104371	DS014AL1SDRHAY	05041	CONNECTOR, 30 Pin
	A1J2	104371	DS014AL1SDRHAY	05041	CONNECTOR, 30 Pin
	A1J3	104371	DS014AL1SDRHAY	05041	CONNECTOR, 30 Pin
	A1K1	105310	0F-1C-24	09026	RELAY, 24 V
	A1K2	105310	0F-1C-24	09026	RELAY, 24 V
	A1K3	105310	0F-1C-24	09026	RELAY, 24 V
	A1Q1	105666	2N4314	18714	TRANSISTOR, PNP Silicon, TO-5
	A1Q2	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1Q3				Not used
	A1Q4	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1Q5	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1Q6	105673	2N5087	04713	TRANSISTOR, PNP Silicon, TO-92
	A1Q7	105673	2N5087	04713	TRANSISTOR, PNP Silicon, TO-92
	A1Q8	105673	2N5087	04713	TRANSISTOR, PNP Silicon, TO-92
	A1Q9	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1Q10	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1Q11	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1Q12				Not used
	A1Q13	105666	2N4314	18714	TRANSISTOR, PNP Silicon, TO-5
	A1Q14	105666	2N4314	18714	TRANSISTOR, PNP Silicon, TO-5
	A1Q15	105666	2N4314	18714	TRANSISTOR, PNP Silicon, TO-5

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	A1Q16	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1Q17	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1Q18	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A1R1	104885	RL07S104G	24546	RESISTOR, Metal Film, 100 kΩ ±2%, 1/4 W
	A1R2	104885	RL07S104G	24546	RESISTOR, Metal Film, 100 kΩ ±2%, 1/4 W
	A1R3	104885	RL07S104G	24546	RESISTOR, Metal Film, 100 kΩ ±2%, 1/4 W
	A1R4	104885	RL07S104G	24546	RESISTOR, Metal Film, 100 kΩ ±2%, 1/4 W
	A1R5	104885	RL07S104G	24546	RESISTOR, Metal Film, 100 kΩ ±2%, 1/4 W
	A1R6	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A1R7	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R8	104889	RL07S154G	24546	RESISTOR, Metal Film, 150 kΩ ±2%, 1/4 W
	A1R9	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A1R10	104965		01121	RESISTOR, Carbon, 330 kΩ ±10%, 1/4 W
	A1R11	104862	RL07S113G	24546	RESISTOR, Metal Film, 11 kΩ ±2%, 1/4 W
	A1R12	104923		01121	RESISTOR, Carbon, 5.1 Ω ±5%, 1/4 W
	A1R13				RESISTOR, Selected at Test
	A1R14				RESISTOR, Selected at Test
	A1R15	104827	RL07S391G	24546	RESISTOR, Metal Film, 390 Ω ±2%, 1/4 W
	A1R16	104883	RL07S823G	24546	RESISTOR, Metal Film, 82 kΩ ±2%, 1/4 W
	A1R17	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R18	104870	RL07S243G	24546	RESISTOR, Metal Film, 24 kΩ ±2%, 1/4 W
	A1R19	104844	RL07S202G	24546	RESISTOR, Metal Film, 2000 Ω ±2%, 1/4 W
	A1R20	104973		01121	RESISTOR, Carbon, 1.2 MΩ ±10%, 1/4 W
	A1R21	104873	RL07S333G	24546	RESISTOR, Metal Film, 33 kΩ ±2%, 1/4 W
	A1R22	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A1R23				Not used
	A1R24				Not used
	A1R25				Not used
	A1R26	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R27	104854	RL07S512G	24546	RESISTOR, Metal Film, 5100 Ω ±2%, 1/4 W
	A1R28	104833	RL07S681G	24546	RESISTOR, Metal Film, 680 Ω ±2%, 1/4 W
	A1R29	104819	RL07S181G	24546	RESISTOR, Metal Film, 180 Ω ±2%, 1/4 W
	A1R30	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A1R31	104870	RL07S243G	24546	RESISTOR, Metal Film, 24 kΩ ±2%, 1/4 W
	A1R32	105493	ZV5021	75042	RESISTOR, Variable, 5000 Ω (Band 3 Seq. Stop)
	A1R33	104873	RL07S333G	24546	RESISTOR, Metal Film, 33 kΩ ±2%, 1/4 W
	A1R34	104858	RL07S752G	24546	RESISTOR, Metal Film, 7500 Ω ±2%, 1/4 W
	A1R35	105493	ZV5021	75042	RESISTOR, Variable, 5000 Ω (Band 2 Seq. Stop)
	A1R36	104858	RL07S752G	24546	RESISTOR, Metal Film, 7500 Ω ±2%, 1/4 W
	A1R37	104870	RL07S243G	24546	RESISTOR, Metal Film, 24 kΩ ±2%, 1/4 W
	A1R38	105493	ZV5021	75042	RESISTOR, Variable, 5000 Ω (Band 1 Seq. Stop)
	A1R39	104858	RL07S752G	24546	RESISTOR, Metal Film, 7500 Ω ±2%, 1/4 W
	A1R40	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A1R41	104870	RL07S243G	24546	RESISTOR, Metal Film, 24 kΩ ±2%, 1/4 W
	A1R42	104870	RL07S243G	24546	RESISTOR, Metal Film, 24 kΩ ±2%, 1/4 W
	A1R43	104885	RL07S104G	24546	RESISTOR, Metal Film, 100 kΩ ±2%, 1/4 W
	A1R44	104872	RL07S303G	24546	RESISTOR, Metal Film, 30 kΩ ±2%, 1/4 W
	A1R45	104877	RL07S473G	24546	RESISTOR, Metal Film, 47 kΩ ±2%, 1/4 W
	A1R46	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A1R47	104863	RL07S123G	24546	RESISTOR, Metal Film, 12 kΩ ±2%, 1/4 W
	A1R48	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R49	104972		01121	RESISTOR, Carbon, 1 MΩ ±10%, 1/4 W
	A1R50	104877	RL07S473G	24546	RESISTOR, Metal Film, 47 kΩ ±2%, 1/4 W
	A1R51	104857	RL07S682G	24546	RESISTOR, Metal Film, 6800 Ω ±2%, 1/4 W
	A1R52	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R53	105494	ZV1031	75042	RESISTOR, Variable, 10 kΩ (Bandswitch Bias Adj.)
	A1R54	105494	ZV1031	75042	RESISTOR, Variable, 10 kΩ (Band 1 Seq. Start)
	A1R55	104879	RL07S563G	24546	RESISTOR, Metal Film, 56 kΩ ±2%, 1/4 W
	A1R56				RESISTOR, Selected at Test
	A1R57	104860	RL07S912G	24546	RESISTOR, Metal Film, 9100 Ω ±2%, 1/4 W
	A1R58	104843	RL07S182G	24546	RESISTOR, Metal Film, 1800 Ω ±2%, 1/4 W
	A1R59	104860	RL07S912G	24546	RESISTOR, Metal Film, 9100 Ω ±2%, 1/4 W
	A1R60	104851	RL07S392G	24546	RESISTOR, Metal Film, 3900 Ω ±2%, 1/4 W
	A1R61	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R62	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R63	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R64	104971		01121	RESISTOR, Carbon, 820 kΩ ±10%, 1/4 W
	A1R65	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R66	105494	ZV1031	75042	RESISTOR, Variable, 10 kΩ (Band 2 Seq. Start)
	A1R67	105494	ZV1031	75042	RESISTOR, Variable, 10 kΩ (Band 3 Seq. Start)

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	A1R68	105510	300-500	75042	RESISTOR, Variable, 500 Ω (Band 1/Band 2 Crossover)
	A1R69	105510	300-500	75042	RESISTOR, Variable, 500 Ω (Band 2/Band 3 Crossover)
	A1R70	104971		01121	RESISTOR, Carbon, 820 kΩ ±10%, 1/4 W
	A1R71	104873	RL07S333G	24546	RESISTOR, Metal Film, 33 kΩ ±2%, 1/4 W
	A1R72	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R73	104841	RL07S152G	24546	RESISTOR, Metal Film, 1500 Ω ±2%, 1/4 W
	A1R74				Not used
	A1R75				Not used
	A1R76				Not used
	A1R77	104965		01121	RESISTOR, Carbon, 330 kΩ ±10%, 1/4 W
	A1R78	104963		01121	RESISTOR, Carbon, 220 kΩ ±10%, 1/4 W
	A1R79				Not used
	A1R80				Not used
	A1R81	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A1R82	104862	RL07S113G	24546	RESISTOR, Metal Film, 11 kΩ ±2%, 1/4 W
	A1R83	104845	RL07S222G	24546	RESISTOR, Metal Film, 2200 Ω ±2%, 1/4 W
	A1R84	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A1R85	104887	RL07S124G	24546	RESISTOR, Metal Film, 120 kΩ ±2%, 1/4 W
	A1R86	104887	RL07S124G	24546	RESISTOR, Metal Film, 120 kΩ ±2%, 1/4 W
	A1R87	104887	RL07S124G	24546	RESISTOR, Metal Film, 120 kΩ ±2%, 1/4 W
	A1R88	104863	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A1R89	104856	RL07S622G	24546	RESISTOR, Metal Film, 6200 Ω ±2%, 1/4 W
	A1R90	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A1R91	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R92	104871	RL07S273G	24546	RESISTOR, Metal Film, 27 kΩ ±2%, 1/4 W
	A1R93	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R94	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R95	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R96	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R97	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R98	104829	RL07S470G	24546	RESISTOR, Metal Film, 470 Ω ±2%, 1/4 W
	A1R99	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R100	104844	RL07S202G	24546	RESISTOR, Metal Film, 2000 Ω ±2%, 1/4 W
	A1R101	104844	RL07S202G	24546	RESISTOR, Metal Film, 2000 Ω ±2%, 1/4 W
	A1R102	104844	RL07S202G	24546	RESISTOR, Metal Film, 2000 Ω ±2%, 1/4 W
	A1R103	104844	RL07S202G	24546	RESISTOR, Metal Film, 2000 Ω ±2%, 1/4 W
	A1R104	104844	RL07S202G	24546	RESISTOR, Metal Film, 2000 Ω ±2%, 1/4 W
	A1R105	104844	RL07S202G	24546	RESISTOR, Metal Film, 2000 Ω ±2%, 1/4 W
	A1R106	104849	RL07S332G	24546	RESISTOR, Metal Film, 3300 Ω ±2%, 1/4 W
	A1R107	104873	RL07S333G	24546	RESISTOR, Metal Film, 33 kΩ ±2%, 1/4 W
	A1R108	104849	RL07S332G	24546	RESISTOR, Metal Film, 3300 Ω ±2%, 1/4 W
	A1R109	104873	RL07S333G	24546	RESISTOR, Metal Film, 33 kΩ ±2%, 1/4 W
	A1R110	104849	RL07S332G	24546	RESISTOR, Metal Film, 3300 Ω ±2%, 1/4 W
	A1R111	104873	RL07S333G	24546	RESISTOR, Metal Film, 33 kΩ ±2%, 1/4 W
	A1R112	105416	RW69V101	01686	RESISTOR, Wirewound, 100 Ω ±5%, 3 W
	A1R113	105424	3X450	63743	RESISTOR, Wirewound, 500 Ω ±5%, 3 W
	A1R114	105416	RW69V101	01686	RESISTOR, Wirewound, 100 Ω ±5%, 3 W
	A1R115	104843	RL07S182G	24546	RESISTOR, Metal Film, 1800 Ω ±2%, 1/4 W
	A1R116	105416	RW69V101	01686	RESISTOR, Wirewound, 100 Ω ±5%, 3 W
	A1R117	105424	3X450	63743	RESISTOR, Wirewound, 500 Ω ±5%, 3 W
	A1R118	105416	RW69V101	01686	RESISTOR, Wirewound, 100 Ω ±5%, 3 W
	A1R119	105416	RW69V101	01686	RESISTOR, Wirewound, 100 Ω ±5%, 3 W
	A1R120	105424	3X450	63743	RESISTOR, Wirewound, 500 Ω ±5%, 3 W
	A1R121	105416	RW69V101	01686	RESISTOR, Wirewound, 100 Ω ±5%, 3 W
	A1R122	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A1R123	104863	RL07S123G	24546	RESISTOR, Metal Film, 12 kΩ ±2%, 1/4 W
	A1R124	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R125	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
	A1R126	104737	RL07S020G	24546	RESISTOR, Metal Film, 2 Ω ±2%, 1/4 W
	A1R127	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R128	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
	A1R129	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R130	104737	RL07S020G	24546	RESISTOR, Metal Film, 2 Ω ±2%, 1/4 W
	A1R131	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R132	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A1R133	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R134	104837	RL07S102G	24546	RESISTOR, Metal Film, 1000 Ω ±2%, 1/4 W
	A1R135	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	A1R136	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R137	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A1R138	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A1R139	104867	RL07S183G	24546	RESISTOR, Metal Film, 18 kΩ ±2%, 1/4 W
	A1R140	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A1R141	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A1R142	104867	RL07S183G	24546	RESISTOR, Metal Film, 18 kΩ ±2%, 1/4 W
	A1R143	104977		01121	RESISTOR, Carbon, 1.8 MΩ ±10%, 1/4 W
	A1R144	104871	RL07S273G	24546	RESISTOR, Metal Film, 27 kΩ ±2%, 1/4 W
	A1R145	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A1R146	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A1R147	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A1R148	104849	RL07S332G	24546	RESISTOR, Metal Film, 3300 Ω ±2%, 1/4 W
	A1R149	105494	ZV1031	75042	RESISTOR, Variable, 10 kΩ (Sweep Speed Limit)
	A1R150	104888	RL07S134G	24546	RESISTOR, Metal Film, 130 kΩ ±2%, 1/4 W
	A1R151	104838	RL07S112G	24546	RESISTOR, Metal Film, 1100 Ω ±2%, 1/4 W
	A1R152	104967		01121	RESISTOR, Carbon, 470 kΩ ±10%, 1/4 W
	A1S1 A1S2 A1S3	105741	3XF12.52U2U2UGR	31918	SWITCH ASSEMBLY, Three Station Interlocked (LEVELING)
		100766	TXBF632-0258	98978	HEATSINK, Transistor, TO-5
		03946604	06-05-3071	27264	INSULATOR, Socket, 7 pin in-line
		104376	60217-1	05041	KEY, Polarizing (for J1-J3)
		105619	BHS-5-TO5	71002	PAD, Transistor, TO-5
		102431	1938-48-7	27264	SOCKET, In-Line, 7 pin
		104304	2010B	88245	TERMINAL, Hollow
		2C946250		01220	BOARD, Printed Circuit

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
8-4	A2	95077101		01220	BOARD ASSY -- OSCILLATOR DRIVER (2.0-8.0 GHz) Consisting of:
	A2C1	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A2C2	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A2C3	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A2C4	107036	DM10680J	72136	CAPACITOR, Mica, 68 pF ±5%, 500 V
	A2C5	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A2C6	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A2C7	100276	DM15FC331J0	72136	CAPACITOR, Mica, 330 pF ±5%, 500 V
	A2C8	104136	DM15050K	72136	CAPACITOR, Mica, 5 pF ±5%, 500 V
	A2C9				Not used
	A2C10	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A2C11	108179	MTP330-10	90201	CAPACITOR, Tantalum, 330 μF ±20%, 10 V
	A2C12				Not used
	A2C13	104147	192P1039R8	56289	CAPACITOR, Mylar, .01 μF ±10%, 80 V
	A2C14	100153	192P33292	56289	CAPACITOR, Mylar, .0033 μF ±10%, 200 V
	A2C15	100253	DM15CD100J0	72136	CAPACITOR, Mica, 10 pF ±5%, 500 V
	A2CR1	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A2CR2	100386	1N827	71590	DIODE, Reference, 6.2 V ±.001%/°C
	A2CR3	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A2CR4	105660	ID200	12969	DIODE, Silicon-Controlled Rectifier
	A2CR5	105592	1N5247	04713	DIODE, Zener, 17 V ±10%, 1/2 W
	A2CR6	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A2CR7	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A2CR8	105531	1N4005	12954	DIODE, Silicon, 1 A
	A2CR9	105582	1N4748	04713	DIODE, Zener, 22 V ±5%, 1 W
	A2CR10	107120	1N914	07263	DIODE, Silicon
	A2CR11	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A2CR12	105575	1N5241B	04713	DIODE, Zener, 11 V ±5%, 1/2 W
	A2IC1	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A2IC2	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A2IC3	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A2IC4	107322	741HC	07263	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A2K1	105311	10A1N-AA24	09026	RELAY
	A2Q1	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A2Q2	105652	2N2102	18714	TRANSISTOR, NPN Silicon, TO-5
	A2Q3	101378	2N3906	04713	TRANSISTOR, PNP Silicon
	A2Q4	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A2R1	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A2R2	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A2R3	104843	RL07S182G	24546	RESISTOR, Metal Film, 1800 Ω ±2%, 1/4 W
	A2R4	105496	310-5K	75042	RESISTOR, Variable, 5000 Ω ±10%
	A2R5	105490	310-1K	75042	RESISTOR, Variable, 1000 Ω ±10%
	A2R6	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A2R7	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A2R8				RESISTOR, Value Selected at Test
	A2R9	104863	RL07S123G	24546	RESISTOR, Metal Film, 12 kΩ ±2%, 1/4 W
	A2R10	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A2R11	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A2R12	108150		01121	RESISTOR, Carbon, 3 MΩ ±5%, 1/4 W
	A2R13	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A2R14	104875	RL07S393G	24546	RESISTOR, Metal Film, 39 kΩ ±2%, 1/4 W
	A2R15				Not used
	A2R16				RESISTOR, Value Selected at Test
	A2R17	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A2R18	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A2R19	104806	RL07S510G	24546	RESISTOR, Metal Film, 51 Ω ±2%, 1/4 W
	A2R20	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
	A2R21	104821	RL07S221G	24546	RESISTOR, Metal Film, 220 Ω ±2%, 1/4 W
	A2R22	104874	RL07S363G	24546	RESISTOR, Metal Film, 36 kΩ ±2%, 1/4 W
	A2R23	104870	RL07S243G	24546	RESISTOR, Metal Film, 24 kΩ ±2%, 1/4 W
	A2R24	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A2R25	105496	310-5K	75042	RESISTOR, Variable, 5000 Ω ±10%
	A2R26	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A2R27	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A2R28	104854	RL07S512G	24546	RESISTOR, Metal Film, 5100 Ω ±2%, 1/4 W
	A2R29	104871	RL07S273G	24546	RESISTOR, Metal Film, 27 kΩ ±2%, 1/4 W

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	A2R30	105490	310-1K	75042	RESISTOR, Variable, 1000 Ω ±10%
	A2R31	104856	RL07S622G	24546	RESISTOR, Metal Film, 6200 Ω ±2%, 1/4 W
	A2R32	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A2R33	104869	RL07S223G	24546	RESISTOR, Metal Film, 22 kΩ ±2%, 1/4 W
	A2R34	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A2R35	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A2R36	104806	RL07S510G	24546	RESISTOR, Metal Film, 51 Ω ±2%, 1/4 W
	A2R37	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
	A2R38	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
		105619	BHS-5-TO5	71002	PAD, Transistor
		2C950771		01220	BOARD, Printed Circuit

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
8-5	A3	95077102		01220	BOARD ASSY -- OSCILLATOR DRIVER (8.0-12.4 GHz) Consisting of:
	A3C1	104105	81131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A3C2	104105	81131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A3C3	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A3C4	107036	DM10680J	72136	CAPACITOR, Mica, 68 pF ±5%, 500 V
	A3C5	104105	81131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A3C6	104105	81131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A3C7	100276	DM15FC331J0	72136	CAPACITOR, Mica, 330 pF ±5%, 500 V
	A3C8	104136	DM15050K	72136	CAPACITOR, Mica, 5 pF ±5%, 500 V
	A3C9				Not used
	A3C10	104105	81131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A3C11	108179	MTP330-10	90201	CAPACITOR, Tantalum, 330 μF ±20%, 10 V
	A3C12				Not used
	A3C13	104147	192P1039R8	56289	CAPACITOR, Mylar, .01 μF ±10%, 80 V
	A3C14	100153	192P33292	56289	CAPACITOR, Mylar, .0033 μF ±10%, 80 V
	A3C15	102547	DM15CD390J0	52136	CAPACITOR, Mica, 39 pF, 500 V
	A3CR1	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A3CR2	100386	1N827	71590	DIODE, Reference, 6.2 V ±.001%/°C
	A3CR3	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A3CR4	105660	ID200	12969	DIODE, Silicon-Controlled Rectifier
	A3CR5				DIODE, Zener, value selected at test
	A3CR6	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A3CR7	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A3CR8	105531	1N4005	12954	DIODE, Silicon, 1 A
	A3CR9	105582	1N4748	04713	DIODE, Zener, 22 V ± 5%, 1 W
	A3CR10	107120	1N914	07263	DIODE, Silicon
	A3CR11	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A3CR12				Not used
	A3IC1	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A3IC2	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A3IC3	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A3IC4	107322	741HC	07263	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A3K1	105311	10A1N-AA24	09026	RELAY
	A3Q1	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A3Q2	105652	2N2102	18714	TRANSISTOR, NPN Silicon, TO-5
	A3Q3	101378	2N3906	04713	TRANSISTOR, PNP Silicon
	A3Q4	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A3R1	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A3R2	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A3R3	104843	RL07S182G	24546	RESISTOR, Metal Film, 1800 Ω ±2%, 1/4 W
	A3R4	105496	310-5K	75042	RESISTOR, Variable, 5000 Ω ±10%
	A3R5	105490	310-1K	75042	RESISTOR, Variable, 1000 Ω ±10%
	A3R6	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A3R7	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A3R8				Not used
	A3R9	104863	RL07S123G	24546	RESISTOR, Metal Film, 12 kΩ ±2%, 1/4 W
	A3R10	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A3R11	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A3R12	104974		01121	RESISTOR, Carbon, 2.2 MΩ ±5%, 1/4 W
	A3R13	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A3R14	104875	RL07S393G	24546	RESISTOR, Metal Film, 39 kΩ ±2%, 1/4 W
	A3R15				RESISTOR, Value Selected at Test
	A3R16				RESISTOR, Selected at Test
	A3R17	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A3R18	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A3R19	104806	RL07S510G	24546	RESISTOR, Metal Film, 51 Ω ±2%, 1/4 W
	A3R20	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
	A3R21	104821	RL07S221G	24546	RESISTOR, Metal Film, 220 Ω ±2%, 1/4 W
	A3R22	104867	RL07S183G	24546	RESISTOR, Metal Film, 18 kΩ ±2%, 1/4 W
	A3R23	104865	RL07S153G	24546	RESISTOR, Metal Film, 15 kΩ ±2%, 1/4 W
	A3R24	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A3R25	105497	310-10K	75042	RESISTOR, Variable, 10 kΩ ±10%
	A3R26	104859	RL07S822G	24546	RESISTOR, Metal Film, 8200 Ω ±2%, 1/4 W
	A3R27	104883	RL07S823G	24546	RESISTOR, Metal Film, 82 kΩ ±2%, 1/4 W
	A3R28	104854	RL07S512G	24546	RESISTOR, Metal Film, 5100 Ω ±2%, 1/4 W
	A3R29	104871	RL07S273G	24546	RESISTOR, Metal Film, 27 kΩ ±2%, 1/4 W

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	A3R30	105490	310-1K	75042	RESISTOR, Variable, 1000 Ω ±10%
	A3R31	104851	RL07S392G	24546	RESISTOR, Metal Film, 3900 Ω ±2%, 1/4 W
	A3R32	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A3R33	104869	RL07S223G	24546	RESISTOR, Metal Film, 22 kΩ ±2%, 1/4 W
	A3R34	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A3R35	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A3R36	104806	RL07S510G	24546	RESISTOR, Metal Film, 51 Ω ±2%, 1/4 W
	A3R37	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
	A3R38	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
		105619	BHS-5-TO5	71002	PAD, Transistor
		2C950771		01220	BOARD, Printed Circuit

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
8-6	A4	95077103		01220	BOARD ASSY -- OSCILLATOR DRIVER (12.4-18.0 GHz) Consisting of:
	A4C1	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A4C2	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A4C3	102545	DM15ED270J0	72136	CAPACITOR, Mica, 27 pF ±5%, 500 V
	A4C4	107036	DM10680J	72136	CAPACITOR, Mica, 68 pF ±5%, 500 V
	A4C5	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A4C6	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A4C7	100276	DM15FC331J0	72136	CAPACITOR, Mica, 330 pF ±5%, 500 V
	A4C8	104136	DM15050K	72136	CAPACITOR, Mica, 5 pF ±5%, 500 V
	A4C9				Not used
	A4C10	104105	8131100W5R0104K	72982	CAPACITOR, Ceramic, 0.1 μF ±10%, 100 V
	A4C11	108179	MTP330-10	90201	CAPACITOR, Tantalum, 330 μF ±20%, 10 V
	A4C12				Not used
	A4C13	104147	192P1039R8	56289	CAPACITOR, Mylar, .01 μF ±10%, 80 V
	A4C14	100153	192P33292	56289	CAPACITOR, Mylar, .0033 μF ±10%, 80 V
	A4C15	100175	DM15CD330J0	72136	CAPACITOR, Mica, 33 pF, 500 V
	A4CR1	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A4CR2	100386	1N827	71590	DIODE, Reference, 6.2 V ±.001%/°C
	A4CR3	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A4CR4	105660	ID200	12969	DIODE, Silicon-Controlled Rectifier
	A4CR5				DIODE, Zener, value selected at test
	A4CR6	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A4CR7	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A4CR8	105531	1N4005	12954	DIODE, Silicon, 1 A
	A4CR9	105582	1N4748	04713	DIODE, Zener, 22 V ± 5%, 1 W
	A4CR10	107120	1N914	07263	DIODE, Silicon
	A4CR11	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A4CR12				Not used
	A4IC1	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A4IC2	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A4IC3	025745	LM301AH	27014	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A4IC4	107332	741HC	07263	INTEGRATED CIRCUIT, Operational Amplifier, TO-5
	A4K1	105311	10A1N-AA24	09026	RELAY
	A4Q1	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A4Q2	105652	2N2102	18714	TRANSISTOR, NPN Silicon, TO-5
	A4Q3	101378	2N3906	04713	TRANSISTOR, PNP Silicon
	A4Q4	105654	2N3391	03494	TRANSISTOR, NPN Silicon, R-67
	A4R1	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A4R2	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A4R3	104843	RL07S182G	24546	RESISTOR, Metal Film, 1800 Ω ±2%, 1/4 W
	A4R4	105496	310-5K	75042	RESISTOR, Variable, 5000 Ω ±10%
	A4R5	105490	310-1K	75042	RESISTOR, Variable, 1000 Ω ±10%
	A4R6	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A4R7	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A4R8				Not used
	A4R9	104863	RL07S123G	24546	RESISTOR, Metal Film, 12 kΩ ±2%, 1/4 W
	A4R10	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A4R11	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A4R12	108150		01121	RESISTOR, Carbon, 3 MΩ ±5%, 1/4 W
	A4R13	104878	RL07S513G	24546	RESISTOR, Metal Film, 51 kΩ ±2%, 1/4 W
	A4R14	104875	RL07S393G	24546	RESISTOR, Metal Film, 39 kΩ ±2%, 1/4 W
	A4R15				RESISTOR, value selected at test
	A4R16				RESISTOR, Selected at Test
	A4R17	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A4R18	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A4R19	104806	RL07S510G	24546	RESISTOR, Metal Film, 51 Ω ±2%, 1/4 W
	A4R20	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
	A4R21	104821	RL07S221G	24546	RESISTOR, Metal Film, 220 Ω ±2%, 1/4 W
	A4R22	104871	RL07S273G	24546	RESISTOR, Metal Film, 27 kΩ ±2%, 1/4 W
	A4R23	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A4R24	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A4R25	105497	310-10K	75042	RESISTOR, Variable, 10 kΩ ±10%
	A4R26	104874	RL07S363G	24546	RESISTOR, Metal Film, 36 kΩ ±2%, 1/4 W
	A4R27	104886	RL07S114G	24546	RESISTOR, Metal Film, 110 kΩ ±2%, 1/4 W
	A4R28	104854	RL07S512G	24546	RESISTOR, Metal Film, 5100 Ω ±2%, 1/4 W
	A4R29	104871	RL07S273G	24546	RESISTOR, Metal Film, 27 kΩ ±2%, 1/4 W

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	A4R30	105490	310-1K	75042	RESISTOR, Variable, 1000 Ω ±2%, 1/4 W
	A4R31	104847	RL07S272G	24546	RESISTOR, Metal Film, 2700 Ω ±2%, 1/4 W
	A4R32	104868	RL07S203G	24546	RESISTOR, Metal Film, 20 kΩ ±2%, 1/4 W
	A4R33	104869	RL07S223G	24546	RESISTOR, Metal Film, 22 kΩ ±2%, 1/4 W
	A4R34	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	A4R35	104853	RL07S472G	24546	RESISTOR, Metal Film, 4700 Ω ±2%, 1/4 W
	A4R36	104806	RL07S510G	24546	RESISTOR, Metal Film, 51 Ω ±2%, 1/4 W
	A4R37	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
	A4R38	104813	RL07S101G	24546	RESISTOR, Metal Film, 100 Ω ±2%, 1/4 W
		105619	BHS-5-TO5	71002	PAD, Transistor
		2C950771		01220	BOARD, Printed Circuit

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
8-7	A5	95074601		01220	BOARD ASSY -- POWER METER LEVELING Consisting of:
	A5C1	107627	3420-050E105M	29577	CAPACITOR, Ceramic, 1 μF ±20%, 50 V
	A5CR1	105532	1N4446	03494	DIODE, Silicon, 75 PIV
	A5K1	105310	0F-1C-24	09026	RELAY, SPDT, 24 V
	A5K2	105310	0F-1C-24	09026	RELAY, SPDT, 24 V
	A5K3	105310	0F-1C-24	09026	RELAY, SPDT, 24 V
	A5R1	104871	RL07S273G	24546	RESISTOR, Metal Film, 27 kΩ ±2%, 1/4 W
	A5R2	104876	RL07S433G	24546	RESISTOR, Metal Film, 43 kΩ ±2%, 1/4 W
	A5S1	107635	51MP	05464	SWITCH, DPDT
		104255	2021B-1	88245	TERMINAL, Bifurcated, Small
		2C950746		01220	BOARD, Printed Circuit
8-8	A6	95076701		01220	BOARD ASSY -- INTERCONNECT Consisting of:
	A6J1	108103	1-87227-8	00779	CONNECTOR, Header, 36-pin male
	A6Q1	101394	2N5190	04713	TRANSISTOR, NPN Silicon
	A6Q2	101394	2N5190	04713	TRANSISTOR, NPN Silicon
	A6Q3	101394	2N5190	04713	TRANSISTOR, NPN Silicon
	A6Q4	101394	2N5190	04713	TRANSISTOR, NPN Silicon
	A6Q5	101394	2N5190	04713	TRANSISTOR, NPN Silicon
	A6Q6	101405	2N5193	04713	TRANSISTOR, PNP Silicon
	A6Q7	101405	2N5193	04713	TRANSISTOR, PNP Silicon
	A6Q8	101405	2N5193	04713	TRANSISTOR, PNP Silicon
		928999		01220	BLOCK, Transistor Mounting, heatsink
		108110	MK77-2	04713	MOUNTING KIT, Transistor
		2C950767		01220	BOARD, Printed Circuit

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
8-1	AT1	962205	PMI-2280-1	16453	ISOLATOR, Band 1
	CP1	107123	2081-0000	26805	ADAPTER, SMA, male/male
	CR1				Not used
8-3	CR2	105297	MV-5022	29083	DIODE, Light-Emitting, red
8-1	CR3	105574	1N5231	04713	DIODE, Zener, 5.1 V, 1 W
	DC1	962217		01220	DETECTOR, Directional (Option M2) Includes:
	J6				CONNECTOR, Flange Mount, APC-7
	J7				CONNECTOR, Receptacle, BNC female
	HY1	962218	AER0635	53720	CIRCULATOR, Band 2
	HY2	962197	AER0288	53720	CIRCULATOR, Band 3
	J1	104370	26-159-32	89709	CONNECTOR, Plug, 32-pin male
8-3	J2	101155	UG-1094/U	89709	CONNECTOR, Receptacle, BNC
	J3	101155	UG-1094/U	89709	CONNECTOR, Receptacle, BNC
	J4	104323	KC79-67	91836	CONNECTOR, Receptacle, isolated BNC
	J5	104323	KC79-67	91836	CONNECTOR, Receptacle, isolated BNC
8-1	J6				Part of W1 (Standard) or DC1 (Option M2)
	J7				Part of DC1 (Option M2)
8-3	P1				CABLE, Interconnect Containing:
		107651	86016-1	00779	CONTACT, Connector, crimp
		107939	86148-9	00779	HOUSING, Connector, 36 contact
		107654	87077-1	00779	INSERT, Keying, connector
	P2				Not used
	P3				Not used
	P4				Not used
	P5				Not used
	P6				Not used
	P7				Part of W3
	R1	104861	RL07S103G	24546	RESISTOR, Metal Film, 10 kΩ ±2%, 1/4 W
	R2	105499	WA1G040P103UA	01121	RESISTOR, Variable, 10 kΩ
	R3	104961		01121	RESISTOR, Carbon, 22 Ω ±1%, 1/4 W
	R4	105500	WA1G125103UA	01121	RESISTOR, Variable, 10 kΩ
	R5	105499	WA1G040P103UA	01121	RESISTOR, Variable, 10 kΩ
	R6	105500	WA1G125103UA	01121	RESISTOR, Variable, 10 kΩ
8-1	R7	105458	RH5-10	91637	RESISTOR, Wirewound, 10 Ω ±1%, 5 W
	R8	105440	RH5-5	91637	RESISTOR, Wirewound, 5 Ω ±1%, 5 W
	R9	105439	RH5-2.5	91637	RESISTOR, Wirewound, 2.5 Ω ±1%, 5 W
	R10	105421	3X300	63743	RESISTOR, Wirewound, 300 Ω ±5%, 3 W
8-3	S1	102306	SS-50	78488	SWITCH, Slide, DPDT
8-1	S2	962201	MT3653-94	17540	SWITCH, Coaxial, 3-band
8-7	S200	105713		83330	SWITCH, Slide, SPDT (Option M7)
8-1	W1	948632		01220	CABLE ASSY -- RF Output, standard Containing:
	J6	104372	2699B	13047	CONNECTOR, Cable-Mount Flange, APC-7S Including:
		108151	131-129	89709	CONTACT, Inner
		107071	UT-141A	93306	CABLE, Coaxial, 50 Ω semi-rigid (.141" dia.)
		107070	OSM201-1A	16179	CONNECTOR, Cable-Mount, SMA male
	W1	948630		01220	CABLE ASSY -- RF Output, option M2 Containing:
		107071	UT-141A	93306	CABLE, Coaxial, 50 Ω semi-rigid (.141" dia.)
		107070	OSM201-1A	16179	CONNECTOR, Cable-Mount, SMA male
	W2	948631		01220	CABLE ASSY -- AT1 to S2 Containing:
		107392	UT-85	93306	CABLE, Coaxial,50 Ω semi-rigid (.085" dia.)
		104310	OSM201-2A	16179	CONNECTOR, Cable-Mount, SMA female

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	W3	948642		01220	CABLE ASSY -- Internal Leveling, option M2 Containing:
		107391	8270	16428	CABLE, Coaxial, 50 Ω miniature - RG-196/U
		101179	15875	89709	CONNECTOR, Plug, BNC male
	Y1	962206	SF6-0296M	24539	OSCILLATOR, Band 1 Includes: DIODE, Zener, ≥15 V (value selected by mfr.) DIODE, Zener, ≥5 V (value selected by mfr.)
	Y2	962199	SDYX-3000-103	29111	OSCILLATOR, Band 2 Includes: DIODE, Zener, value selected by mfr.
	Y2	962208	VSX-9080AB	99313	OSCILLATOR, Band 2, alternate
	Y3	962198	SDYX-3001-103	29111	OSCILLATOR, Band 3 Includes: DIODE, Zener, value selected by mfr.
	Y3	962211	VSU-9076CH	99313	OSCILLATOR, Band 3, alternate
		105800	TM256C	06383	ANCHOR, Strap, nylon
		928998		01220	BLOCK, Mounting, RF deck heatsink
		922227		01220	BRACKET, Connector, rear
		916164		01220	BRACKET, Isolator Mounting, AT1
				01220	BRACKET, Switch-Mounting, Option M7 Containing:
		104475	184	83330	BEARING, Panel
		922188			BRACKET, Lower
		922189			BRACKET, Upper
		101020	180	83330	COUPLING, Shaft
		105223	28420-125A-20	08547	SHAFT, 1/8" x 1-1/4"
		105721	FU12BLK	31918	BUTTON, Switch, black
		916104		01220	COVER, Bottom
		916100		01220	COVER, Left Side
		916163		01220	COVER, Right Side
		916103		01220	COVER, Top
		948533		01220	DRUM ASSY -- Dial Scale Containing
		948407		01220	DRUM SUBASSY (less frequency scales)
		922251		01220	SCALE, Frequency, 2 to 8 GHz
		922241		01220	SCALE, Frequency, 7.9 to 12.5 GHz
		922319		01220	SCALE, Frequency, 12.3 to 18.5 GHz
		922318		01220	SCALE, Frequency, 2 to 18.5 GHz
		934220		01220	FILTER, Air
		928772		01220	GUIDE, Plug-in
		105780	105780	52542	HANDLE, Pull
		928996		01220	HEATSINK, Oscillator Mounting, Y2
		928997		01220	HEATSINK, Oscillator Mounting, Y2 alternate
		928995		01220	HEATSINK, Oscillator Mounting, Y3
		928997		01220	HEATSINK, Oscillator Mounting, Y3 alternate
		928994		01220	HEATSINK, RF Deck
		105979	RB67-0-SB-DC-M	86797	KNOB, Black (POWER)
		960019		01220	KNOB, Red (TRACKING VOLTAGE ADJUST)
		104681	27-99-123-10	94222	LATCH, Locking
		915121		01220	PANEL, Front, standard
		915121M7		01220	PANEL, Front, option M7
		915121M26		01220	PANEL, Front, option M26
		916158		01220	PANEL, Rear, standard
		916158M26		01220	PANEL, Rear, option M26
		100753	SST1M	06383	STRAP, Self-Locking, nylon

MANUAL ADDENDUM

DESCRIPTION OF CHANGE: This addendum adds an alternate part number for the Option M2 internal directional detector. The alternate part is electrically identical to the part shown in the photographs within this manual, but is of a different physical configuration. The alternate directional detector is equipped with a female SMA output connector. Coaxial adapter CP2 is added as a transition from the SMA output of the directional detector to the APC-7 RF OUT connector.

Reference designations J8 and J9 are added; J8 is the SMA output connector of DC1 alternate (the directional detector) and J9 is the SMA male portion of coaxial adapter CP2. The designation of RF OUT connector J6 is not changed, although in the alternate configuration J6 is the APC-7 male portion of coaxial adapter CP2.

DIRECTIONS:

1. If your unit is not equipped with internal leveling option M2, no action is necessary.

2. If your unit is equipped with option M2 using the internal leveling detector shown in the photograph of Figure 5-1, page 5-23, no action is necessary.

3. If your unit is equipped with the alternate configuration leveler, insert this notice between pages 7-18 and 8-1/8-2 and mark your manual to reference this notice (page 7-19) on the following pages:

    a. *Page 5-23:*

        1) Add the designation *(CP2)* to RF OUT connector J6 on the photograph.
        2) Add the designation *(J8)* and the designation *(J9)* to the photograph where directional detector DC1 joins the front panel.

    b. *Page 7-17:*

        1) Mark the page immediately after item CP1 to indicate that CP2 has been added.
        2) Mark the page immediately after item DC1 to indicate that an alternate part has been added.
        3) Mark the page immediately after item J7 to indicate that an alternate part has been added and that items J8 and J9 have been added.
        4) Mark the page immediately after item W1 to indicate that an alternate part has been added for the M2 option.

DATA: Applicable portions of the parts list of page 7-17 are reproduced on page 7-20. The parts listed for the original configuration of DC1 are shown in Roman (vertical) type. The added alternate parts are shown in *Italic type.*

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR.	DESCRIPTION
	CP1	107123	2081-0000	26805	ADAPTER, SMA, male/male
	CP2	*113456*		*01220*	*ADAPTER, Coaxial, SMA male to APC-7 female* *Includes:*
	J9				*CONNECTOR, SMA male*
	J6				*CONNECTOR, APC-7* *Including:*
		108151	*131-129*	*89709*	*CONTACT, Inner*
	DC1	962217		01220	DETECTOR, Directional (Option M2) Includes:
	J6				CONNECTOR, Flange Mount, APC-7
	J7				CONNECTOR, Receptacle, BNC female
	DC1	*962202*		*01220*	*DETECTOR, Directional (Option M2 Alternate)* *Includes:*
	J8				*CONNECTOR, Receptacle, SMA female*
	J7				*CONNECTOR, Receptacle, BNC female*
	J6				Part of W1 (Standard) or DC1 (Option M2)
	J6				*Part of CP2 (Option M2 alternate)*
	J7				Part of DC1 (Option M2)
	J7				*Part of DC1 (Option M2 alternate)*
	J8				*Part of DC1 (Option M2 alternate)*
	J9				*Part of CP2 (Option M2 alternate)*
	W1	948360		01220	CABLE ASSY – RF OUTPUT, Option M2 Containing:
		107071	UT-141A	93306	CABLE, Coaxial, 50 Ω semi-rigid (.141" dia.)
		107070	OSM201-1A	16179	CONNECTOR, Cable Mount, SMA male
	W1	*948662*		*01220*	*CABLE ASSY – RF OUTPUT, Option M2 alternate* *Containing:*
		107071	*UT-141A*	*93306*	*CABLE, Coaxial, 50 Ω semi-rigid (.141" dia.)*
		107070	*OSM201-1A*	*16179*	*CONNECTOR, Cable Mount, SMA male*

SECTION VIII

SCHEMATICS AND BOARD DRAWINGS

This section contains the following drawings:

Figure	Title	Page
8-1	RF Deck Interconnect Diagram	8-3
8-2	A1 Continuous Sweep Mother Board Parts Location	8-5
8-3	A1 Continuous Sweep Mother Board Schematic Diagram	8-7
8-4	A2 Band 1 Oscillator Driver Board Parts Location/Schematic Diagram	8-9
8-5	A3 Band 2 Oscillator Driver Board Parts Location/Schematic Diagram	8-11
8-6	A4 Band 3 Oscillator Driver Board Parts Location/Schematic Diagram	8-13
8-7	A5 Power Meter Leveling Board (Option M7) Parts Location/ Schematic Diagram	8-15
8-8	A6 Interconnect Board Parts Location/Schematic Diagram	8-17

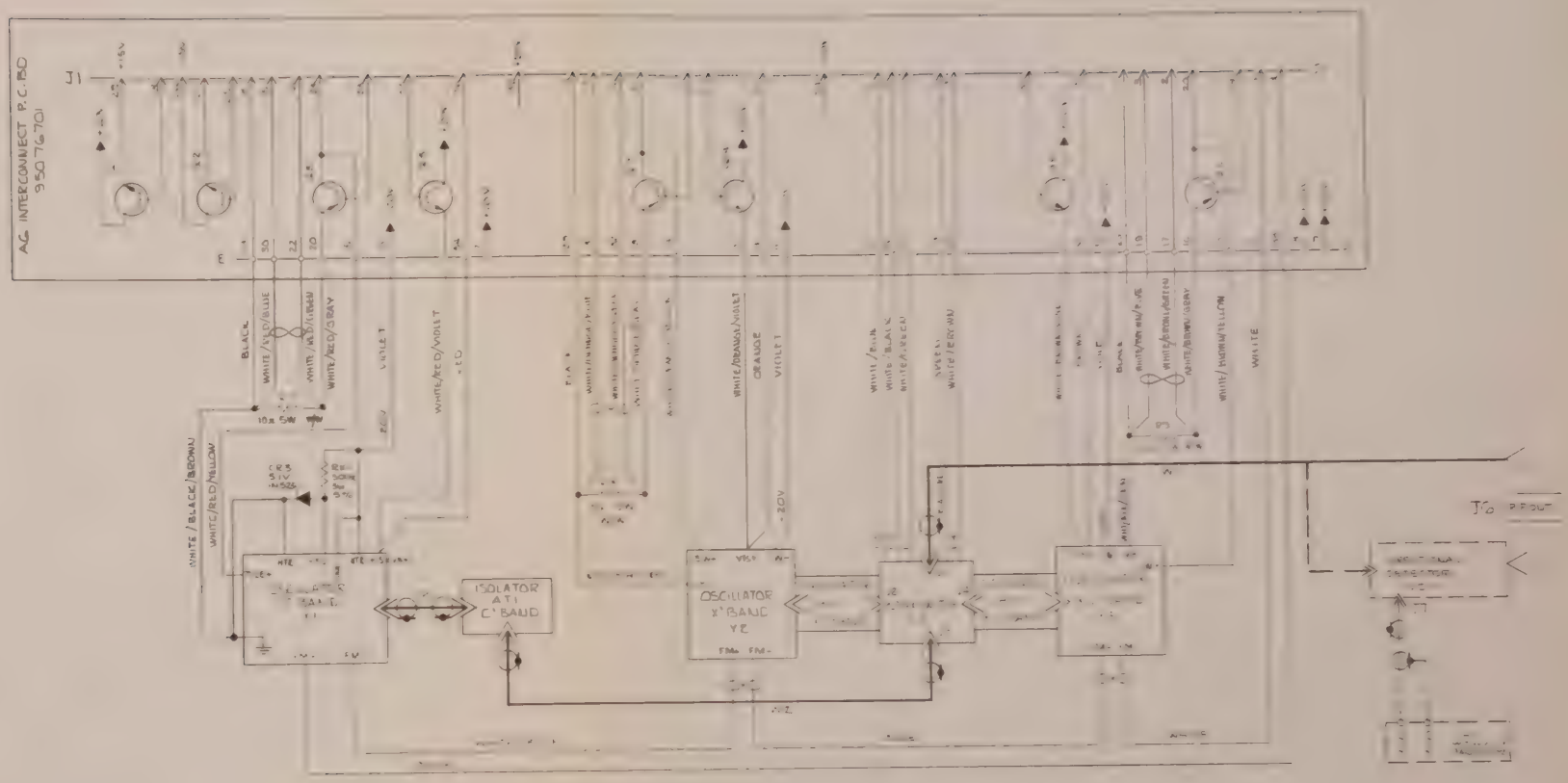


Figure 8-1. RF Deck Interconnect Diagram

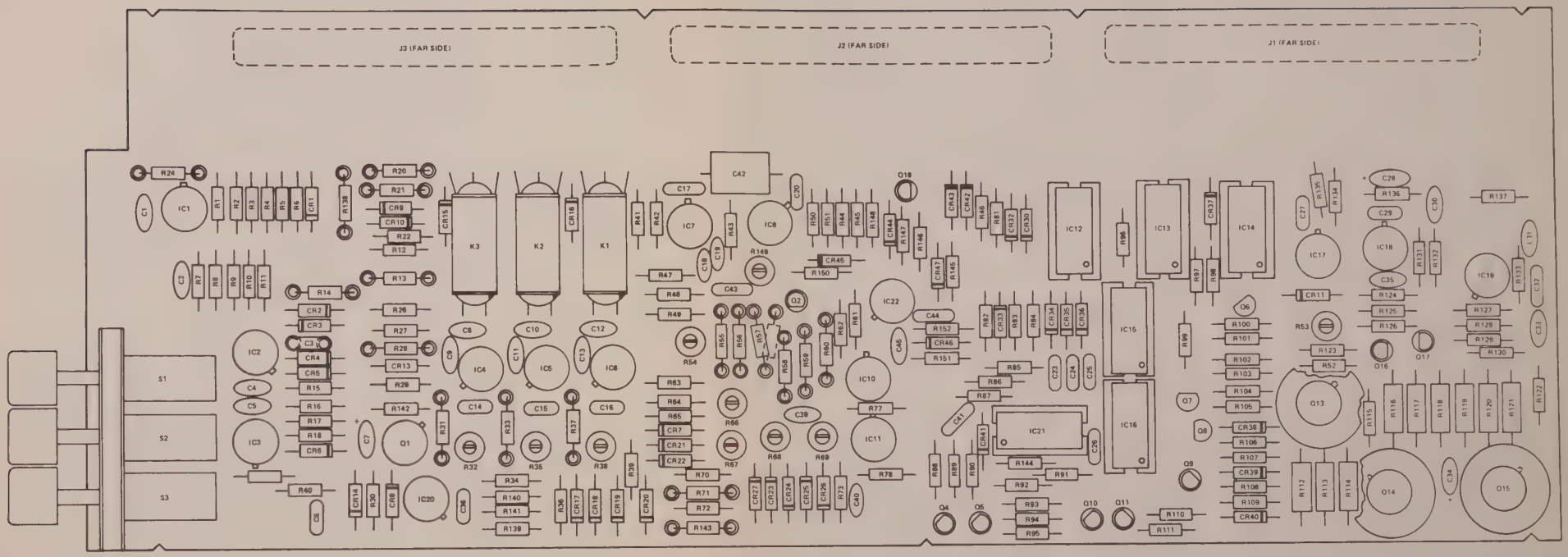


Figure 8-2. A1 Continuous Sweep Mother Board Parts Location

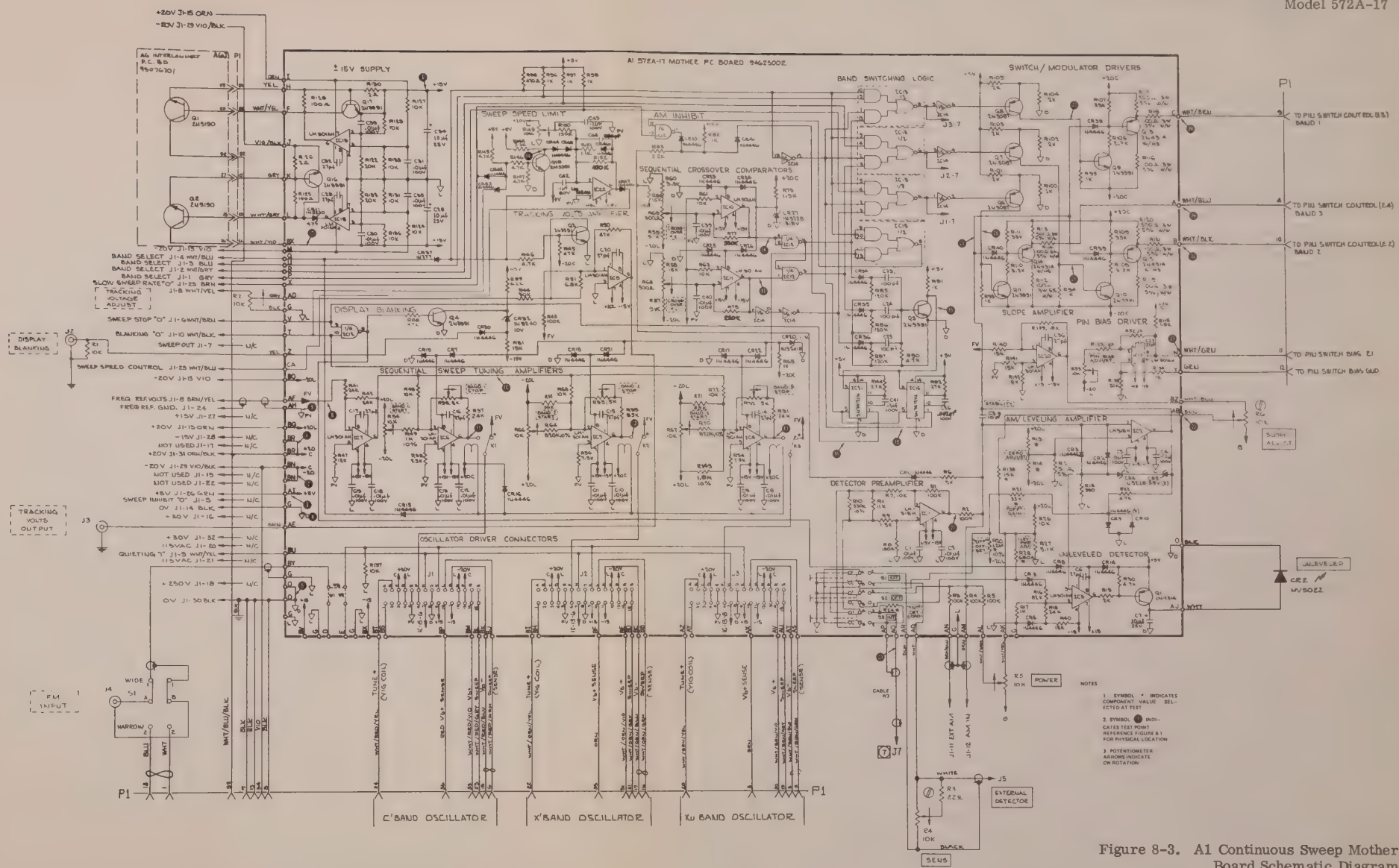
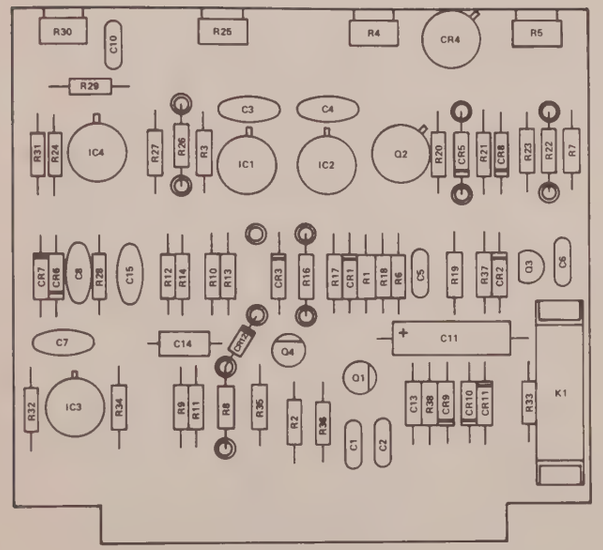
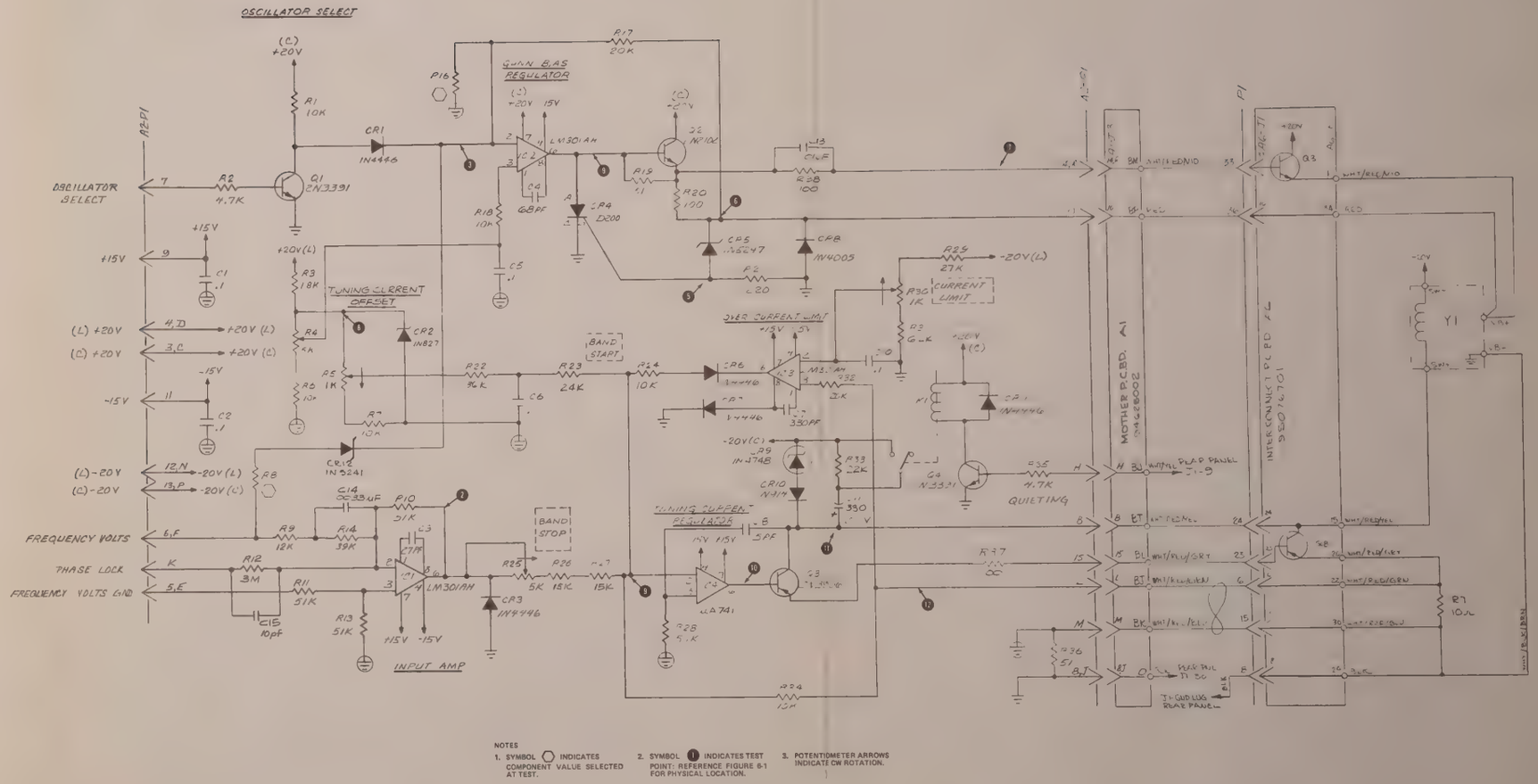
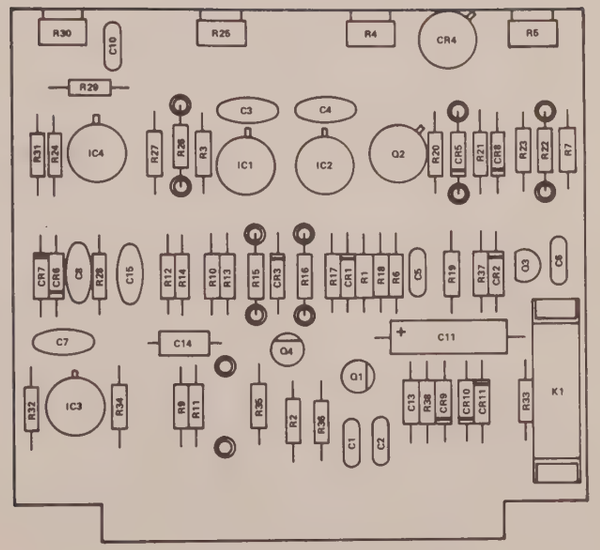
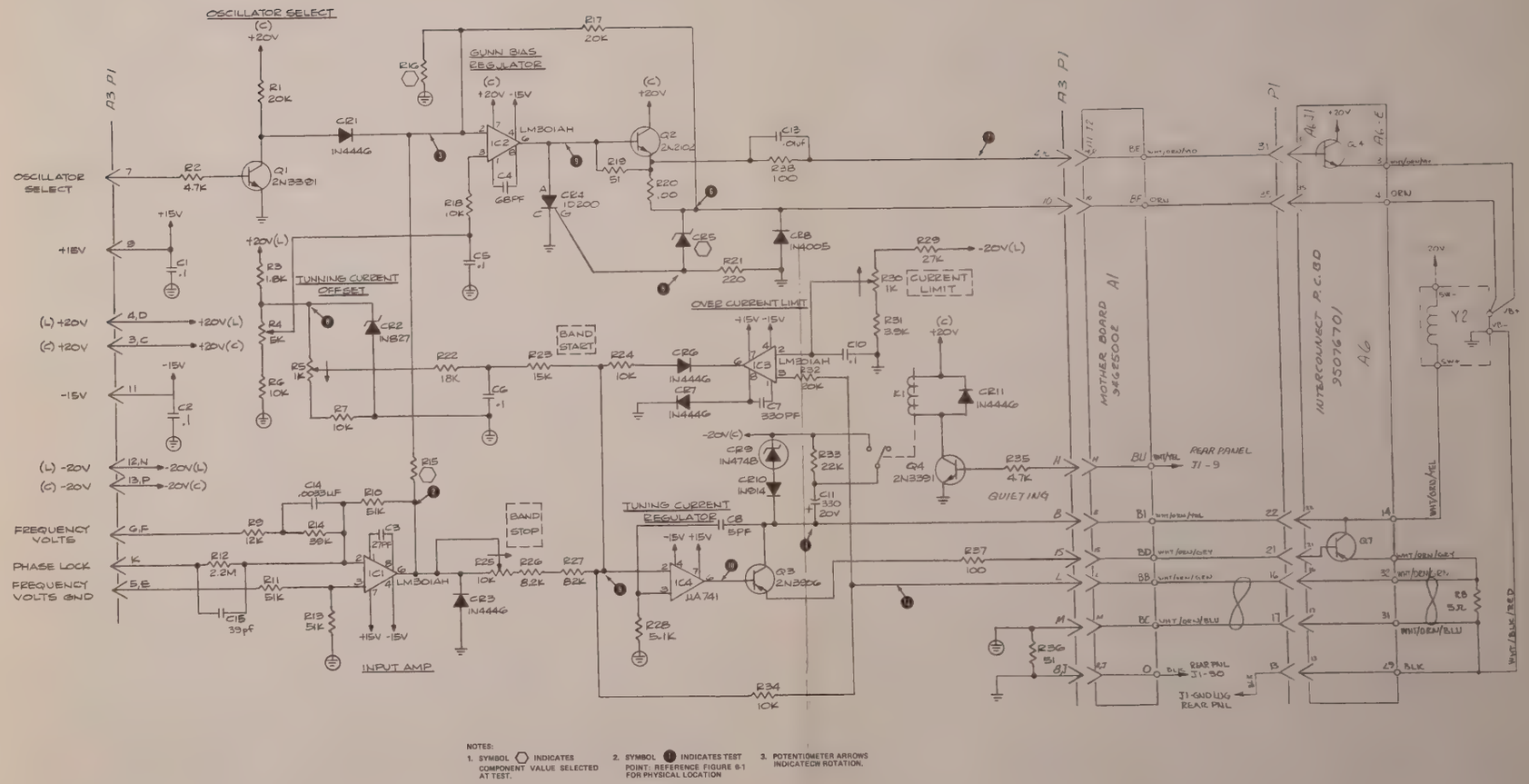


Figure 8-3. A1 Continuous Sweep Mother Board Schematic Diagram



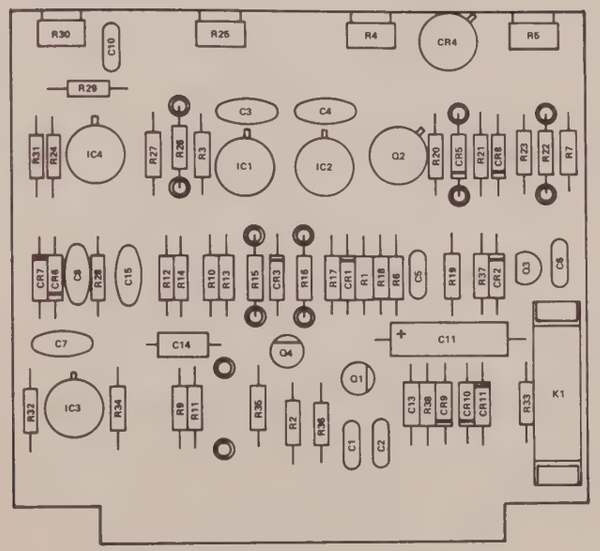

OSCILLATOR SELECT
(C) +20V
R1 10K
CR1 IN4446
Q1 2N3391
OSCILLATOR SELECT
+15V
(L) +20V
(C) +20V
-15V
(L)-20V
(C)-20V
FREQUENCY VOLTS
PHASE LOCK
FREQUENCY VOLTS GND
R2 4.7K
A2P1
7
9
11
4,D
3,C
12,N
13,P
6,F
K
5,E
C1 .1
C2 .1
+20V(L)
+20V (L)
+20V (C)
-20V (L)
-20V (C)
R3 18K
TUNING CURRENT OFFSET
R4 4K
R5 1K
R6 10K
R7 10K
CR2 IN827
CR12 IN5241
R8
R9 12K
R14 39K
R12 3M
R11 51K
C15 10pf
C14 .033uF
C7 ?
R10 51K
C3
LM301AH
R13 51K
+15V -15V
CR3 IN4446
INPUT AMP
BAND START
BAND STOP
R22 36K
R23 24K
R24 10K
C6
R25 5K
R26 15K
R27 15K
R17 20K
P16
GUNN BIAS REGULATOR
(C) +20V 15V
LM301AH
R18 10K
R19 .1
C4 68PF
R20 100
CR4 D200
C5 .1
C13 .1uF
R28 100
CR5 IN5247
CR6 IN4005
F2 1.20
R29 27K
-20V(L)
R30 1K
CURRENT LIMIT
OVER CURRENT LIMIT
+15V
CR6 IN446
CR7 IN446
M3.3AH
R32 2K
350PF
R3 6.2K
+20V(C)
CR11 IN4746
-20V(C)
CR9 IN4748
CR10 N4M
R33 2.2K
C11 330 10V
Q2 N3391
R35 4.7K
QUIETING
TUNING CURRENT REGULATOR
-15V +15V
C8 .5PF
C9 .33uF
uA741
R28 5.1K
R24 10K
R37
R36 51
R7 10.2K
A1-P1
MOTHER P.C.BD. A1
INTERCONNECT PC PD A2
560-7670-01
P1
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
J12
J13
J14
J15
J16
J17
J18
J19
J20
J21
J22
J23
J24
J25
J26
J27
J28
J29
J30
J31
J32
J33
J34
J35
J36
J37
J38
J39
J40

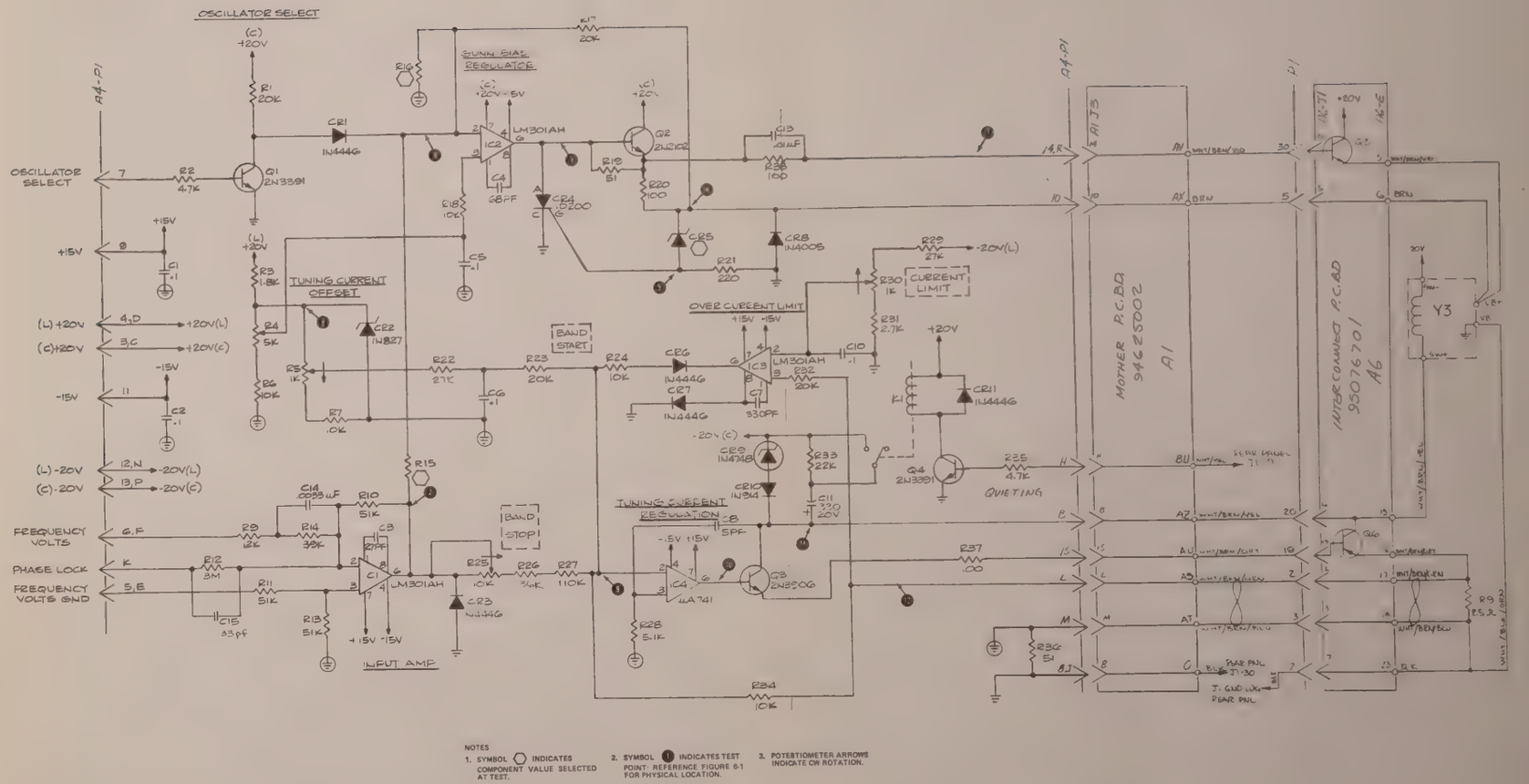




NOTES:
1. SYMBOL ⬡ INDICATES COMPONENT VALUE SELECTED AT TEST.
2. SYMBOL ⓣ INDICATES TEST POINT: REFERENCE FIGURE 6-1 FOR PHYSICAL LOCATION
3. POTENTIOMETER ARROWS INDICATECW ROTATION.

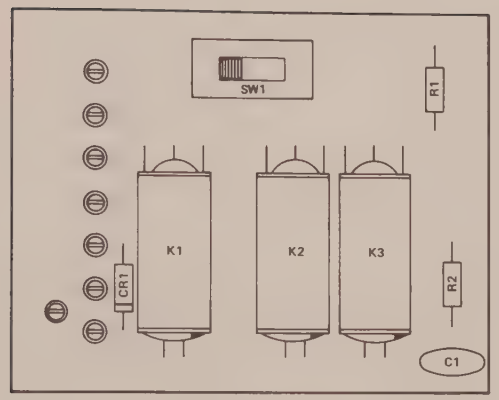
Figure 8-5. A3 Band 2 Oscillator Driver Board Parts Location/Schematic Diagram





NOTES
1. SYMBOL ⬡ INDICATES COMPONENT VALUE SELECTED AT TEST.
2. SYMBOL ⓣ INDICATES TEST POINT- REFERENCE FIGURE 6-1 FOR PHYSICAL LOCATION.
3. POTENTIOMETER ARROWS INDICATE CW ROTATION.

Figure 8-6. A4 Band 3 Oscillator Driver Board Parts Location/Schematic Diagram



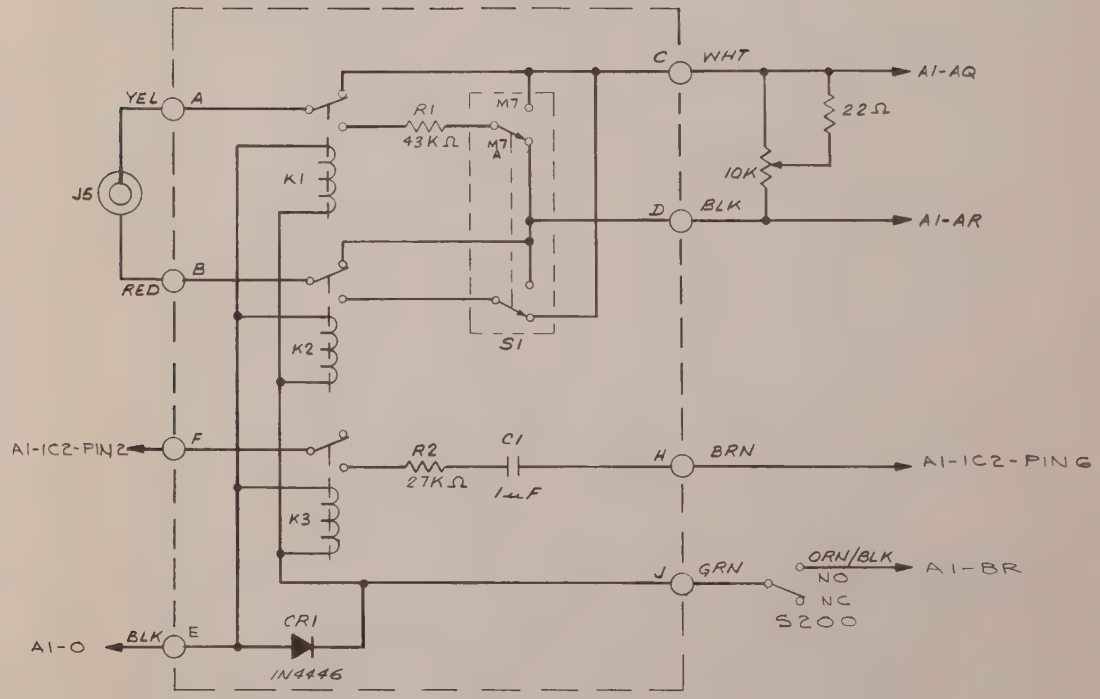
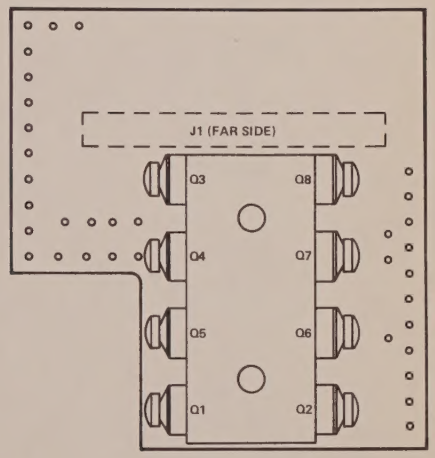
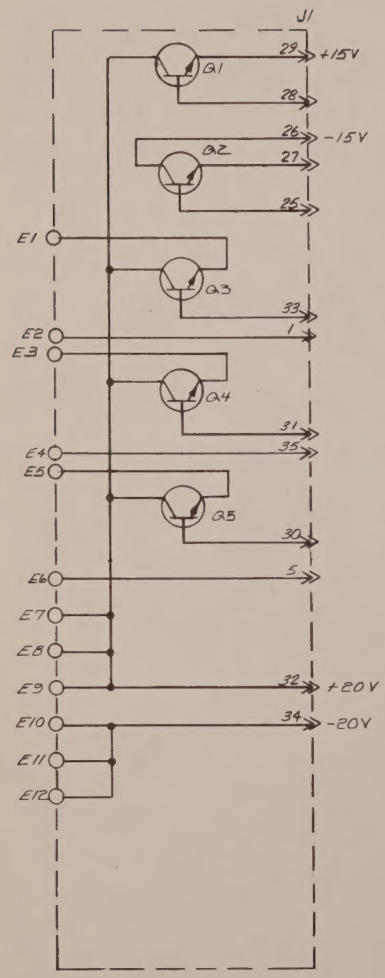


Figure 8-7. A5 Power Meter Leveling Board (Option M7) Parts Location/ Schematic Diagram





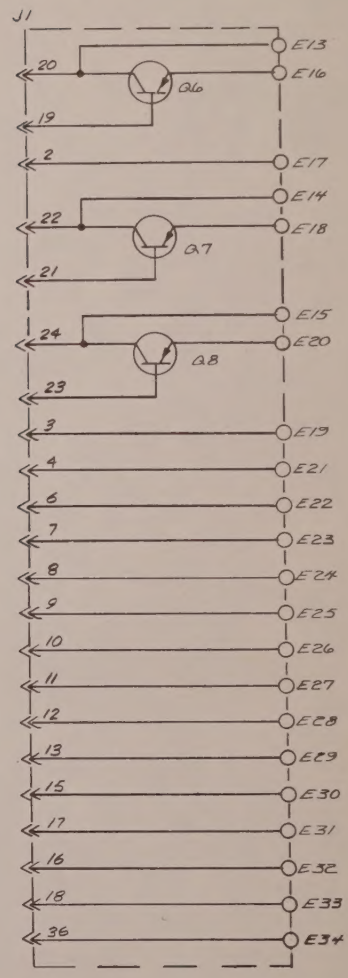


Figure 8-8. A6 Interconnect Board Parts Location/Schematic Diagram